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A
COMPENDIUM
OF
ANATOMY.

Robert Ross

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# A
COMPENDIUM
# OF
ANATOMY,
HUMAN AND COMPARATIVE;

WITH DIRECTIONS FOR DISSECTING THE DIFFERENT PARTS OF THE HUMAN BODY.

INTENDED PRINCIPALLY FOR THE USE OF STUDENTS.

BY ANDREW FYFE,

FELLOW OF THE ROYAL COLLEGE OF SURGEONS OF EDINBURGH,
&c. &c.

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REVISED AND CORRECTED BY

ANDREW FYFE, M.D. F.R.S.E. &c. &c.

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PART IV.

OF THE

VISCERA,

AND

ORGANS OF THE SENSES.

OF THE

VISCERA,

AND

ORGANS OF THE SENSES.

OF THE COMMON INTEGUMENTS.

These consist of the *Cuticle*, *Corpus Mucosum*, *Cutis Vera*, with their Appendages.

Cuticle.

The *Cuticle*, *Epidermis*, or *Skarf-skin*, is a thin, greyish, semi-transparent, insensible Membrane, which covers the Skin, and adheres to it by small Vascular Filaments.

It is readily *separated* from the Cutis by boiling water, or by putrefaction, and, in the living Body, by the application of blisters.

Over the Body, in general, it is extremely dense, and neither laminæ nor fibres can be detected in it, but it is not every where of the same *density*, being, even in a Fœtus, thickest in the Palms and Soles; in which parts, the thickness is afterwards much increased by pressure, and then a lamellated structure is evident.

The *External Surface* is marked by *Furrows*, which correspond with those in the Cutis Vera.

Upon the Surface of the Body, it is *perforated* by the terminations of Vessels for the Exhalation of the Perspirable Matter; which, when increased in quantity, is considered by most of the modern Physiologists as forming the Sweat. It is perforated also by the ends of the Excretory Ducts, which are found only in particular parts of the Skin; by the beginning of the Absorbents, which take in certain Substances applied to the Surface of the Body; and by the different Hairs.

The *Perforations*, or *Pores*, are most evident upon the Palms and Soles, and upon the Nose, Ears, and external parts of Generation, yet, in a separate piece of Cuticle, the Pores are as invisible as they are in a piece of wet filtrating paper, though obvious when the paper is dry.

The Cuticle *covers* the Skin through its whole extent, excepting under the Nails.

From the external Surface of the Body, it is *reflected inwards*, to line the large passages; as the Nose, Mouth, Alimentary Canal, the Trachea, Urethra, Vagina, &c.

In these passages, however, the Cuticle becomes less uniform in its texture; and in some of them, as in the *Stomach*, it is either wanting, or is so much changed in structure, as to have the appearance of being so.

From the Surface of the Cuticle, certain *Processes* are sent into the Skin, which line the passages by which the Cutis is perforated.

Many opinions have been advanced concerning the *Origin* of the Cuticle. The latest and most probable is, that it is formed by a condensation of the Corpus Mucosum, or by the extremities of Excretory Vessels;—its density, however, is such, that no Vessels can be traced in it, either by the Eye, or by the assistance of glasses. It appears also to be destitute of Absorbent Vessels and Nerves.

The Cuticle serves to protect the sensible parts under it, and to regulate the proportion of the Fluids thrown out, or taken in, by the Surface of the Skin;—particularly, to prevent too great a degree of evaporation.

The Cuticle is found to be insoluble in Water, and also in Alcohol, but is readily dissolved in the Alkalis. It is observed to resemble coagulated Albumen.

CORPUS MUCOSUM.

The *Corpus Mucosum* has been commonly called *Rete Mucosum*, from the supposition that it is formed of a *Mucous Net-work*. It is situated under the Cuticle, which it connects to the Cutis Vera.

It is *composed* of the terminations of extremely minute Vessels passing between the Cutis and Cuticle, which are surrounded by a Mucilaginous or Viscid Substance, properly called *Corpus Mucosum.*

It is the chief cause of that *variety of colour*, which characterizes the natives of different climates, and different people of the same climate; being semi-transparent, and white, or rather of a light grey colour in a

European, black in an Ethiopian, brown in an Asiatic, &c. and in all appearing through the Cuticle, on account of the thinness and transparency of the latter.

It is likewise the cause of the difference of colour, in different parts of the Body of the same person.

It is readily detected in the Sole, especially in the Heel, by spreading out and fixing the Integuments upon a board, and then immersing them a short time in boiling water.

It is *thicker* and *stronger* in a Negro than in a White person, and in the former can be separated into two Layers.

It covers every part of the surface of the Cutis, excepting below the nails, where it is wanting; and is of such a light colour in the Palms and Soles of a Negro, as to have been supposed by some Authors to be deficient there also.

Its *Origin* has not yet been sufficiently ascertained, though by some it has been supposed to be formed by the Vessels imbedded in it, nor is it determined what particular use it serves.

Among other purposes, it contributes to preserve the structure of the tender Vessels, Ducts, and Papillæ, placed between the Cutis and Cuticle; and in a Negro, it is supposed to serve as a defence against the heat of the climate.

CUTIS VERA.

The *Cutis Vera*, *Dermis*, or *Skin* properly so called, lies immediately under the Corpus Mucosum, and gives a covering to the whole Body.

It is *formed* of Fibres intimately interwoven, and running in every direction like the hairs in the felt of a hat, and is so plentifully supplied with Nerves and Blood-vessels, that the smallest puncture cannot be made in any part of it, without occasioning pain and a discharge of Blood.

The *Blood-vessels* of the Cutis are so numerous, especially on its outer Surface, as to appear to form almost the whole of its Substance, and are of such a size as to be injected with facility.

It is strong and very elastic, and may be elongated in every direction, after which it recovers its former dimensions.

It forms the Body and strongest portion of the Skin, and is that part in Quadrupeds of which *Leather* is made.

The *outer part* of it is dense and firm, the inner loose, gradually degenerating into the common Cellular Substance.

It is thicker and looser on the posterior than on the anterior part of the Body, and thicker and firmer in the Palms and Soles than in the other parts of the extremities.

The *colour* of the Cutis also differs in different parts of the Body, in proportion to the quantity of Blood in the extreme Vessels, and to the thinness of the Cuticle.

At the *edge of the Eye-lids*, the *red part of the Lips*, and *margin of the Anus*, the Cutis becomes so immediately and remarkably thin, as to appear to be lost.

The Absorbents of the Cutis are proportionally large and numerous, and are observed, when minutely injected, to have a reteform appearance.

Nerves can be traced in great abundance into the inner part of the Skin, but their branches cannot be detected upon it externally.

Upon the outer Surface of the Cutis, and produced chiefly by the extremities of the Cutaneous Nerves, *small eminences* are observed, called *Papillæ*, *Papillæ Nervosæ*, and *Papillæ Pyramidales*:—the term being borrowed from the Papillæ of the Tongue, which were first discovered, and to which the name is most applicable.

From their being extremely sensible, they are considered as forming the Organ of Touch; and from their being very Vascular, they are also regarded as furnishing a passage to part of the Perspirable Matter.

The *Papillæ* are most evident on the Tongue and edge of the Lips, and in the Palms and Soles, where they are placed in double rows on the Ridges, which, on the points of the Fingers and Toes, generally run in a somewhat spiral and parallel direction.

The *Ridges* are supposed to defend the Papillæ, and to increase the Surface for Perspiration.

In some places, as in the red part of the Lips, the Papillæ, from their resemblance to the Pile of Velvet, are termed *Villi*.

Various kinds of *Folds* are observed in the Skin; some depending upon the form of the Cellular Substance, as in the Hips; others on Muscular Contraction, as in the Fore-head; and others on Articular Motion, as at the Joints of the Extremities,—particularly those of the Fingers and Toes;—and these Folds, to allow easy motion, are thinner than the rest of the Skin.

A sort of Cutis, as well as a Cuticle, has been attempted to be traced from the external parts of the Body along the great passages; but in its course through these, it becomes softer and looser, changing into a fine Cellular Substance.

In an *inflamed Skin*, as in the case of Small-pox, a Reticular Texture of Vessels is observed, which can be easily injected, and has been considered by some as the Corpus Mucosum, and by others, as an additional Cuticle;—but no such appearance is to be met with in the sound Skin.

In the Cutis of the under part of the Abdomen and upper parts of the Thighs of Women who have had Children, there are many Pits of irregular form, which appear to be owing to the formation of a kind of new Skin, filling the parts of the original one, over-stretched during Gestation.

The Cutis Vera serves to cover and give form to the Body; unites the different parts, and defends them from injury; forms the External Organs of Sensation or of Touch, and gives passage to the Fluids which are perspired or absorbed.

The Cutis can be entirely dissolved by the action of boiling water, and consists chiefly of *Gelatin*, in consequence of which it is a principal article in the manufacture of Glue.

APPENDAGES OF THE SKIN.

NAILS.

The *Nails* were formerly regarded as a production of the Papillæ of the Cutis, but are now more generally considered as a continuation of the Cuticle.

They are removed along with it by boiling water, or by maceration.

Like the Cuticle, they are insensible, excepting where they adhere to the Cutis, are renewable after having been separated, and have no evident Vessels.

They differ from it, however, in structure; being formed of *Plates*, and the Plates of *Longitudinal Fibres*, which are closely compacted, as may be seen when they are thoroughly dried, or in a diseased state.

They begin by a transverse edge, a little before the last Joint of the Fingers and Toes.

When separated from the Skin, they are *transparent* like Horn, but are coloured in the living Body by the Vessels of the Cutis, to which they adhere, and from which they derive their nourishment.

They are fixed at their roots to a *Semilunar Fold* of the Cutis, and are there covered by a reflection of the Cuticle, which firmly adheres to them.

They grow from the roots, and not from the points; and begin to be formed about the third month after Conception.

The Nails strengthen and defend the ends of the Fingers and Toes, and thereby serve as Buttresses.

In the Fingers, they increase the power of apprehension, being useful in laying hold of minute objects.

HAIRS.

The *Hairs* arise by Roots or Bulbs, which are situated in the Skin, or in the Cellular Substance under it.

The *Bulbs* are of various shapes in different parts of the Body, and have Blood-vessels dispersed upon them for their nourishment.

Each of the Bulbs has *two Membranes*, or *Capsules*, containing an Oily Fluid between them, which gives colour to the Hair, and for want of which, as in advanced life, when the Capsules shrivel, or in certain diseases, the Hair is supposed to change its colour, and become white. It may be remarked, however, that the Hair, after being cut off, continues uniformly to preserve its colour.

All the Hairs of the Body are of a round form, and taper regularly from their roots towards their point; which circumstance has explained the experiment, that when a Hair is placed lengthways, between the points of the Fingers and Thumb, and these are moved backwards and forwards on each other, the Hair is gradually forced from between them, and always in the direction of its root.

The colour of the Hair has some relation to the Corpus Mucosum, since, in Negroes, the tint of the Hair corresponds with that of the Skin, and in a person with red or with dark-coloured Hair, there is a rosy or a dark complexion.

The Hairs go obliquely through the substance of the

Skin, and in passing from it they carry with them *Processes* of the Epidermis, which serve them as Sheaths, and which are so thin and transparent, as to allow the colour of the Hair to appear through them.

In the Human Body, the Hairs are so slender, that it is difficult to trace their structure; but in the strong Hairs of certain Quadrupeds, this becomes apparent.

By the assistance of a good Glass, these strong Hairs are observed to be composed of a bundle of smaller Hairs, among which are one or two Canals for containing their nourishing Fluid, termed the *Medulla.*

By desiccation, the Hairs separate at their points into thin constituent Filaments.

The Hairs, like the Nails, grow from their bases, in consequence of which, when they are cut short, they seem to increase in number, though it is only in diameter.

The Hairs, like the Cuticle, appear to be destitute of Blood-vessels, Lymphatics, and Nerves.

The Hairs serve in general for the ornament, warmth, or protection of the different parts on or near which they are placed.

The chemical properties of Hairs are nearly the same with those of Cartilage, Cuticle, Horn, &c.

By late experiments it is found, that Hair, boiled in water in PAPIN's Digester, can be completely dissolved; that when Hair is digested in Alcohol, it is deprived of its colour, an oily fluid, considered as the cause of this colour, having been dissolved by the Alcohol; and that each of the Acids acts very sensibly upon the Hair.

SEBACEOUS DUCTS OR FOLLICLES, and MILIARY GLANDS.

The *Sebaceous Follicles* derive their name from the Fluid they contain, becoming like Suet, after acquiring a certain degree of consistency, or being inspissated by stagnation.

They are of a cylindrical form, are placed in the Substance of the Cutis, or directly upon its inner surface, and are found in greatest abundance in those parts which are exposed to the air, or to attrition; as in the Nose, Ears, Nipples, Groins, and external parts of Generation.

The *Sebaceous*, or *Miliary Glands*, are so called from their Contents, and from their resemblance to *Millet Seeds*, and are seated upon the inner side of the Skin of the Axilla.

Other Miliary Glands are described by Authors as being placed under the Skin over the whole Surface of the Body, and as serving for the Secretion of Perspirable Matter;—but they are not demonstrable to such a general extent, and the Sweat is considered as being derived from the Exhalents, as already observed.

These Follicles and Glands secrete a Fluid which serves to lubricate the Skin, and defend it from the inclemency of the weather, or from the effects of friction.

MEMBRANA CELLULARIS, vel TELA CELLULOSA, or RETICULAR, or CELLULAR SUBSTANCE.

This is generally considered as one of the Integuments, though common to these and to the other parts of the Body.

It is *composed* of a fine fibrous Web, formed of many Membranes joined irregularly together, and these made up of Cells, which communicate freely with each other wherever they are found.

It is very elastic, may be drawn out to a considerable extent, after which it suddenly recoils, and may be condensed or compacted to a great degree.

It lines the Skin, covers the Muscles in general, and insinuates itself between their different Fibres ;—is a universal covering to all the other parts, and even enters into the composition of almost every one of them.

It is thickest where the parts are more exposed to pressure, as in the Hips, Palms, and Soles.

The different Cells of which it is composed are constantly moistened by an Interstitial Fluid, and in many parts of the Body are filled with Fat.

Blood-vessels, Absorbents, and Nerves, are in many parts seated in it, but it has little or no Sensibility, can be handled freely, or cut, or punctured, without giving pain.

It serves to connect parts to each other, but so as to prevent them from growing together ;—it covers them, supplies them with Sheaths to move in, and contains the Fat.

CORPUS ADIPOSUM, ADEPS, PINGUEDO, OR FAT.

The *Fat* is lodged in the common Cellular Substance, and is made up of Masses composed of small spherical Vesicles, applied closely together, but scarcely visible to the naked eye, and these are surrounded by a network of Blood-vessels, from which the oily matter composing the Fat is supposed to be secreted, without the intervention of Glands.

The *Vesicles* are not found to have communication with the Cellular Substance, or with each other, nor have any Excretory Ducts yet been perceived in them,—the Fat being supposed to transude from the Cells.

It is of *different colour* and *consistency* in different parts: It varies from a straw colour to a deep yellow hue. In the living body it is generally fluid, though in some parts it approaches to a solid, and is altogether of this nature in the dead Body.

In the Bones, it forms the Marrow, which has been already described.

The Fat is chiefly *situated* immediately under the Skin, and covers almost the whole surface of the Body. It is also found between the different Muscles and Fibres of Muscles,—within the Orbits, and in the Cheeks,—in the Substance of the Mammæ, and about the Heart.

It *abounds* in the Abdomen, about the Kidneys, Loins, Omentum, and Mesentery;—and in the Joints, it forms the Substances called *Glands of the Joints*, as already mentioned.

The Fat is *wanting* in the Scrotum, Penis, and Eyelids, and is found only in small quantity in the Forehead, or about the Joints, where, from its bulk, it would have been inconvenient. It is also wanting in the Substance of the Viscera situated in the great Cavities of the Body; as the Brain, Lungs, Liver, Spleen, Kidneys, &c.

The Fat serves to lubricate every part of the Body to which it is connected, and facilitates the action of the Muscles. It fills the Interstices, so as to give form and smoothness, and to guard against pressure. It serves also for a reservoir of nourishment, to be occasionally re-absorbed, and carried into the constitution.

The chemical properties of Fat are observed to be nearly the same with those of vegetable expressed Oils.

PANNICULUS CARNOSUS, vel TUNICA CARNOSA.

This is a general Covering found in Quadrupeds, and formed by a thin Subcutaneous Muscle, which serves to agitate the Skin.

It exists only in certain parts of the Human Body; as in the Fore-head, where it is formed by the Occipito-frontalis; in the Neck, where it is produced by the Platysma Myoides; and in the Scrotum, where it is formed by the Cremaster Testis.

The Ancients described this as an additional covering.

OF THE BRAIN.

THE term BRAIN is applied to the whole of that Mass, which, with its surrounding Membranes, fills the Cavity of the Cranium; and is larger in Man, in proportion to the Nerves belonging to it, than in any other Animal.

The Brain is divided into *Cerebrum*, *Cerebellum*, *Tuber Annulare*, and *Medulla Oblongata*, the whole of which forming a Mass of about 48 or 50 ounces in weight, but the weight varying in different persons, according to the size of the Head.

The *Membranes* of the Brain were called *Meninges* and *Matres* by the Ancients, from an idea that they gave birth to all the other Membranes of the Body.

They consist of the *Dura Mater*, *Tunica Arachnoidea*, and *Pia Mater*.

The DURA MATER, named from being of a firmer texture than the other two Membranes, incloses the Brain with all its Appendages, and lines the different parts of the Cranium.

Upon the outer Surface of the Dura Mater, there are small fleshy-looking Bodies, placed at irregular distances, which are termed *Glands* of PACCHIONI. These frequently project so much, as to make deep Pits in the Skull.

The Dura Mater is *composed* of one Membrane, which, in several parts, is divisible by maceration into two, or even more Layers of Fibres.

The *Texture* of the Dura Mater is very dense. It is the thickest and strongest Membrane of the Body, and is composed of Tendinous-like Fibres, which have a shining appearance, particularly in its inner Surface. In many parts, these Fibres run in a variety of directions, and decussate each other at different angles.

The Dura Mater *adheres* every where to the Surface of the Cranium by Blood-vessels, in the same manner as the Periosteum adheres to the Bones in the other parts of the Body; but it is more firmly connected at the Sutures and Foramina than elsewhere; and so much more firmly in Children than in Adults, that, in separating it from the Cranium, it is apt to bring along with it some of the Fibres of the Bone to which it is attached.—In the Adult, the separation of the Bone from the Membrane is less difficult, in consequence of many of the Fibres being obliterated.

The *inner Surface* of the Dura Mater, which is remarkably smooth, is in *close contact* with the subjacent Membranes, and adheres to the Brain only where the Veins go into the Sinuses. It is lubricated by a Fluid discharged through its Vessels, which guards the Brain from danger, according as it may be affected by the different states of Respiration.

The Dura Mater serves as a *defence* to the Brain, and supplies the place of a *Periosteum* to the inside of the Bones of the Cranium; giving nourishment to them,—as is evident from the numerous drops of Blood which appear after removing the Skull-cap.

From the inner side of the Dura Mater, *Processes* are sent off, which divide the Brain into certain parts, and serve to keep it steady; viz. the FALX, TENTORIUM, and FALX MINOR.

The FALX, *Septum Cerebri*, or *Vertical Superior Longitudinal Process*, is formed by a doubling of the Dura Mater, and is situated between the Hemispheres of the Brain, which it separates from each other for a considerable way downwards.

It begins at the middle of the Sphenoid Bone, and Crista Galli of the Ethmoid Bone, and runs along the upper and middle part of the Head, adhering first to the Frontal Bone, then to the Sagittal Suture, and afterwards to the middle of the Occipital Bone.

In its passage, it becomes gradually broader, extending from the Cranium above, to near the part of the Brain below termed *Corpus Callosum*, and terminates behind, in the middle of the Tentorium.

It runs from before backwards in a straight direction, and has some resemblance in shape to a *Sickle* or *Scythe*, from which circumstance it has obtained the name of *Falx*.

Between the under edge of the Falx and Base of the Cranium, there is a *large space of an oval form*, occupied by that part of the Brain which is common to the two Hemispheres.

The Falx supports the Tentorium, and is considered as preventing the two sides of the Brain from pressing upon each other, though there have been instances where part, or even the whole, of this Process has been wanting.

The TENTORIUM CEREBELLI, or *Transverse Septum*, or *Lateral Processes* of the Dura Mater.

The *Tentorium* is continued laterally from the Falx, is connected behind to the inner Transverse Ridges and Grooves of the Occipital Bone, and, at the fore and outer edges, to the ridges and great angles of the Petrosal parts of the Temporal Bones, and terminates at the posterior Clinoid Process of the Sphenoid Bone.

Between the middle and inner edges of the Tentorium and Posterior Clinoid Process of the Sphenoid Bone, there is a large *Notch*, or *Foramen Ovale*, where the Cerebrum and Cerebellum are united, or where the Tuber Annulare is chiefly situated.

The Tentorium keeps the Falx *tense*, and forms a *Floor* or *Vault* over the Cerebellum, which prevents the Cerebrum from pressing upon it.

The FALX MINOR, vel *Septum Cerebelli*, which is placed between the Lobes of the Cerebellum. It descends from the under and back part of the Falx and middle of the Tentorium, adheres to the inferior Longitudinal Spine of the Os Occipitis, and terminates insensibly at the posterior edge of the Foramen Magnum of that Bone.

Besides the Processes of the Dura Mater already described, there are four of inferior consideration, two of which are situated at the sides of the Sella Turcica, and two at the edges of the Foramina Lacera.

Several other Processes pass out at the different openings of the Cranium, to be connected to the Pericranium, or to accompany the Spinal Marrow and Nerves.—Those of the last description shall be afterwards taken notice of.

The *Arteries* of the Dura Mater are derived chiefly from the External Carotids, and partly from the Internal Carotids and Vertebrals.

The principal Branches of these Arteries run upon the outside of the Dura Mater, minute Filaments only being observed upon its inner Surface.

The *Veins* of this Membrane are of two kinds. One set of them, like the Veins in other parts of the Body, accompany the Arteries;—the others are termed *Sinuses*, and differ from Veins only in this, that their Transverse Sections are of a triangular figure, and that they are inclosed in a doubling of the Dura Mater, which is so tense over them, that they are little affected by the pressure of the surrounding parts.

In the bottom of the Sinuses are *small Transverse Cords*, termed *Chordæ* WILLISII, which may add a little to their Strength, and assist in preventing them from being too much distended.

The Sinuses serve to carry the Blood from the Brain, and convey it to the Veins of the Neck; for which purpose they are properly fitted, their covering from the Dura Mater giving them strength, and their frequent communications preventing congestion.

The Principal SINUSES *are,*

The *Superior Longitudinal Sinus,* which begins at the Crista Galli of the Ethmoid Bone, runs along the upper edge of the Falx, becomes gradually larger in its progress, and terminates in the beginning of the Lateral Sinuses.

The *Torcular* HEROPHILI, or *Fourth Sinus* of the Ancients;—the term *Torcular* applied from a supposition that the Blood is squeezed in this Sinus as in a Wine-press.—It is chiefly formed of the Vena GALENI, runs in the junction of the Falx and Tentorium, and terminates with the former Sinus in the beginning of the Lateral Sinuses.

The *two Lateral Sinuses,* which are formed by the Longitudinal and Torcular Sinuses. They run in depressions of the Occipital and Temporal Bones, first transversely, and nearly opposite the great external Arch of the Os Occipitis, then in a winding direction downwards, and terminate at the Base of the Cranium, in the beginnings of the Internal Jugular Veins.

Besides the Sinuses mentioned above, several others less conspicuous will be pointed out in the particular description of the Veins.

The *Nerves* of the Dura Mater are so very minute, that they have not as yet been distinctly traced; and it is found to possess very little sensibility in the sound state.

Upon the sides of the Superior Longitudinal Sinus, and parts of the Brain contiguous to it, there are *numerous small Granulations,* which are part of the *Glandu-*

læ PACCHIONI. They are of a whitish colour, scarcely so large as Mustard Seeds, and commonly joined in clusters.

The nature of these Granulations is still unknown. —By some they have been supposed to belong to the Lymphatic System.

The TUNICA ARACHNOIDEA, named from its cobweb appearance, is an exceedingly thin, tender, and transparent Membrane, in which no Vessels have been hitherto observed.

It is spread uniformly over the Surface of the Brain, inclosing all its Convolutions, without insinuating itself between any of them.

At the upper part of the Brain, it adheres so closely to the subjacent Coat by fine Cellular Substance, that it can scarcely be separated from it; but in different parts of the Base of the Brain, particularly about the Tuber Annulare and Medulla Oblongata, it is merely in contact with the Pia Mater, and may readily be raised from it by the assistance of a Blow-pipe.

The Tunica Arachnoidea, like the Cuticle, covers and defends the parts under it.

The PIA MATER, named from its tenderness, is somewhat of the nature of the former Covering, but is extremely vascular. It varies in thickness and strength in different parts of the Brain, according to the number of Vessels dispersed on it.

It envelopes the Brain in general, enters double between all its convolutions, connecting Hemispheres, Lobes, and Convolutions together, and lines the different Cavities called *Ventricles.*

Over the Convolutions this Membrane is remarkably thin and dense; in the Furrows between them it is thicker and looser in its texture, becoming gradually thinner towards the bottom of these.

It serves to contain and support the Vessels of the Brain, and allows them to divide into such minute parts, as to prevent the Blood from entering the tender Substance of this Viscus with too great force.

The *Arteries* of the Pia Mater are the same with those of the Brain, to be afterwards taken notice of.

The *Veins* differ in no respect from those in other parts of the Body, excepting that they are a little more tender, and that they do not in general closely accompany the Arteries.

CEREBRUM.

The *Cerebrum*, or *Brain* properly so called, is situated in the upper part of the Cranium, which, with the membranes, it completely occupies, and is formed of parts which have a general similarity to each other in the opposite sides of the Head.

It is divided into two halves, termed *Hemispheres*, which are separated by a deep fissure in which the Falx is situated.

Each of the Hemispheres is of an *oval form*, or they somewhat resemble an Egg cut longitudinally into two equal parts. The inner sides are flat, and closely applied to the Falx, the upper and outer parts convex, and the under Surface irregular.

The under Surface is divided into *two Anterior*, *two Lateral*, and *two Posterior Lobes*, or *Processes*.

The *Anterior Lobes* are situated in the fore part of the Base of the Cranium, and are the largest of the Lobes.

The *Lateral* or *middle Lobes* are lodged in the Fossæ formed by the Temporal and Sphenoid Bones, and are next in size to the former, but deeper. They pass insensibly into the posterior Lobes.

Between the Anterior and Lateral Lobes on each side, there is a *Furrow* formed by the Anterior Clinoid Process of the Sphenoid Bone, which has been termed *Fossa*, vel *Fissura Magna* SYLVII.

The *Posterior Lobes* are placed over the Cerebellum, and are separated from it by the Tentorium, upon which they rest; the extreme points of these Lobes being nearly on a level with those of the Anterior Lobes.

The Surface of the Brain in general, both above and below, is of a brown colour, and is divided by deep Fissures into many turnings or windings, termed *Circumvolutions*, which run in various directions, close to each other, and are of different sizes and lengths on different parts of the Brain. The fissures between them also vary very considerably in depth.

The Circumvolutions are every where connected to the Pia Mater by an infinite number of small Vessels,—called by RUYSCH, *Tomentum Cerebri*,—which run at right angles into the Substance of the Brain, as may be readily seen, upon separating the Circumvolutions a little from each other, or by raising part of the Pia Mater from the Brain.

The Convolutions are smallest at the fore part of the Brain, larger behind, and largest at the upper and middle parts of the Hemispheres, where each is from half an inch to three quarters of an inch in breadth.

Between the Hemispheres, and at the bottom of the fissure already taken notice of, a broad white Substance is observed, called *Corpus Callosum*, from its being a little firmer than the rest of the Brain. It goes across the Brain, under the Falx, and is merely a continuation of the Medullary Substance, running horizontally, and joining the two sides of the Hemispheres to each other. It is narrow before, broader behind, and is arched or turned a little down at its anterior and posterior edges.

In the middle of the Corpus Callosum, there is a longitudinal *Raphè*, a *Linea Mediana*, with a Medullary Cord on each side, from which many Transverse Streaks issue. These Cords, like the Corpus Callosum itself, become gradually broader towards the Posterior Extremity.

A Section of the Hemispheres of the Brain shews the division into *outer* and *inner*, or *Cortical* and *Medullary Substance*. If this Section be made in a horizontal direction, a little above the middle height of the Brain, or upon a level with the Corpus Callosum, the Medullary Substance then appears in the greatest proportion.

The outer Substance is also termed *Cineritious*, from its somewhat resembling the ashes of wood, of being of a *greyish* colour, though a little tinged with brown, the tinge varying according to the quantity and quality of the Fluid contained in the Blood-vessels;—and *Cortical*, from its *surrounding* the inner part of the Brain, as the Bark does the inner part of a Tree.

It is termed by some Authors *Glandular*, and by others *Secretory*, from a supposition that the Fluid was secreted in it.

The *Cineritious Substance* covers the Brain in general, and enters deep between its Convolutions, is of a soft consistence, about the sixth part of an inch in thickness over the Convolutions, is evidently more Vascular than the Medullary part, as appears by minute Injections thrown into the extreme Branches; but it is uniform, and, in its natural state, without any appearance of a Fibrous Texture.

The inner Substance, improperly termed *Medullary*, is of a white colour, with a slight tinge of yellow, and is considered as giving origin to the different Nerves. It has been called by some *Excretory*, from having been supposed to be formed of hollow Tubes continued from the Vessels of the Cortical part; but no Cavities have ever been observed in the soft Striæ or fibrous-like matter of which it is composed.

A Section of this part of the Brain shews no appearance of Cells, or Globules, or Fibres, but is smooth and uniform when divided by a sharp instrument, and exhibits many red points, which are the cut extremities of Blood-vessels, with the Blood oozing from them. The number of these points varies according to the quantity of Blood remaining in the Brain. The vessels from which the blood issues here, are seldom larger than Hog's Bristles.

A thin slice of it spread on a Glass, and viewed by a microscope, has been found to resemble a kind of pulp, consisting of Globules greatly inferior in size to the Globules of Blood.

The Medullary Substance is greater in quantity, more opake, and somewhat firmer in texture, than the Cineritious Substance, with which it is so intimately connected, as to appear to be a continuation of it.—Streaks are observed in many parts of the Medullary Matter, which run in general in a parallel and transverse direction; and by plunging a part of the Medullary Substance of the Brain, for a few minutes, into boiling oil, or macerating it for a longer period in alcohol, or in some of the diluted acids, &c. so as to render it firmer and more elastic, it may be made, by lacerating it in some particular direction, to exhibit a *fibrous appearance.* Something of the same kind may be seen in the Cortical part, but it is probably not so distinct.

In many parts of the Cineritious Substance, Medullary Matter appears; and, on the contrary, in different parts of the Medullary Substance, Cineritious Matter is found; the two being frequently blended together in the form of Streaks.—*See* MONRO *on the Nervous System.*

Centrum Ovale of VIEUSSENS. This is the Medullary Substance of the Brain, forming a kind of Nucleus, which is seen after removing the Cineritious Substance, and all the Medullary parts mixed with it which lie between the Cortical Convolutions.

To obtain a proper view of the Centrum Ovale, the Nucleus ought to be cut in such a manner as to preserve the Corpus Callosum, and the same convexity with that of the general convexity of the Brain.

The Centrum Ovale forms an *Arch* or *Roof* over the two Lateral Ventricles; and the under part of this Roof, which is smooth and uniform, constitutes the upper part of the Ventricles.

VIEUSSENS considered the Centrum Ovale as the *Great Dispensatory of the Animal Spirits.*

In the Substance of the Brain, there are four Cavities, termed *Ventricles*, viz. two *Lateral*, a *Third* and a *Fourth*.

The four Ventricles have their sides contiguous to each other, are chiefly formed of Medullary Matter, and are lined with a continuation of the Pia Mater conducted in by the Blood-vessels, but differing from that part of the Membrane covering the exterior Surface of the Brain, in having fewer Vessels dispersed upon it.

The Ventricles are constantly moistened by a Fluid, which prevents their opposite sides from adhering to each other.

The *Use* of the Ventricles, as of many other parts of the Brain, is still unknown.

The *Lateral*, formerly called *Superior Ventricles*, are situated in the Hemispheres, one in each.

They are of an irregular form, lying under the Centrum Ovale, and have each three winding Corners, compared by HALLER to Rams' Horns, which are therefore called by him *Cornua*, and the Cavities themselves *Ventriculi Tricornes*.

Each of the Cornua is placed in a corresponding Lobe of the Brain.

The *Anterior Cornua* are separated from each other only by a partition, called *Septum Lucidum*.

The *Posterior Cornua*, called also *Digital Cavities*, are at a considerable distance from each other, but approach nearer at their pointed extremities.

The Anterior and Posterior Cornua run nearly in a horizontal direction, or according to the length of the Hemispheres themselves; while the Inferior pass first downwards, then forwards, and terminate in the Lateral Lobes of the Brain.

In each of the Posterior Cornua there is an Elongation, which terminates behind in a point, and which is called *Ergot* by the French, from its resemblance to the Spur of a Cock; or *Hippocampus Minor*, from its similarity to, and connexion with, the Substance termed *Hippocampus Major.*

In the fore part of the bottom of the Lateral Ventricles, are two Pyriform Eminences, called *Corpora Striata*, which are large and rounded before, where they occupy the whole Anterior Extremities of the Lateral Ventricles, but become gradually narrower, and recede from each other at their posterior extremities.

Their inner edges are concave, and their upper surface is smooth and of a greyish colour.

The *Structure* of these is mostly Cineritious externally, but mixed with Medullary Striæ within, some of which form large Transverse Medullary Arches, and others run more in a straight direction.

Between the posterior halves of the Corpora Striata, are situated the *Thalami Nervorum Opticorum*, which have a roundish form and a Medullary Surface, and have Striæ of Cineritious and Medullary Matter internally; but the Striæ are less distinct than those of the Corpora Striata.

Upon the Surface of these Bodies, there are small *Eminences* or *Tubercles*, some of which are placed upon their superior, and others upon their inferior extremities, which have the name of Corpora Geniculata, and are called Anterior, Posterior, External or Internal, according to their situations.

The inner parts of the Thalami are flat and contiguous; and above, they are so closely connected as to form one continued Surface, called *Commissura Mol-*

lis of the Optic Thalami. This is stretched across like a Bridge, and is best seen when the Thalami are a little separated.

The posterior parts of the Thalami turn downwards and outwards, after which they are elongated, to form the two white Cords, termed *Tractus Optici.*

In the Groove between the Corpora Striata and Thalami, there is a Medullary Band, called *Centrum Semicirculare Geminum of* VIEUSSENS, or *Tœnia Semicircularis of* HALLER, or simply *Plexus,* which is connected at its fore part with the anterior Crus of the Fornix.

Over the Thalami is placed the *Choroid Plexus,* named from its being composed of a Chorus of Vessels and Membranes. It is a fine Vascular Web, consisting of small ramifications of Arteries and Veins, connected by the Pia Mater, and spread upon the Surface of the Thalami, and some of the adjacent parts; processes of it descending behind, and covering the upper portion of the *Pedes Hippocampi.*

The Veins of each Choroid Plexus form a Trunk termed *Vena* GALENI, and the two Venæ GALENI unite together, and terminate in the Torcular HEROPHILI.

The Choroid Plexus frequently contains numerous round *Globules,* resembling Hydatids, which have been considered by some Authors as Lymphatic Glands.

Under the Raphè of the Corpus Callosum, is placed the *Septum Lucidum,* which is of considerable thickness below, but becomes thinner towards its middle and upper part. When viewed laterally, it is observed to be broad before, curved at its edges, and to become gradually narrower towards its posterior extremity.

It is connected above with the Corpus Callosum, below to the Fornix, and forms a distinct Partition between the Lateral Ventricles.

It is composed of two Cineritious and Medullary *Laminæ*, more or less separated from each other at their upper and fore part, by a small Cavity, about a quarter of an inch in length, called *Fissure*, or *Fossa* of SYLVIUS, or *Sinus* of the Septum Lucidum.

This Cavity is considered by some as a *Fifth Ventricle.* It does not, however, communicate with the other Ventricles, though, in some Subjects, it reaches a considerable way backwards, and, as well as the other Cavities of the Brain, has been found full of water in cases of Hydrocephalus.

Under the Septum Lucidum is placed the Substance which has been compared in shape to a *Vault* by the Ancients, and from that has obtained the name of *Fornix.*

The *Fornix* is merely a continuation of the Corpus Callosum and Septum Lucidum, and forms a sort of hollow Ceiling, with four *Pillars,* called *Crura* or *Cornua,* from their winding direction, of which there are two anterior, and two posterior.

The *two Anterior Crura* are short, run close together, and become enlarged at their inferior parts.

The *two Posterior Crura* are long, at a considerable distance from each other, and form Curvatures which correspond with the course of the Inferior Cornua of the Lateral Ventricles.

That part of the Crura Fornicis lying in the Inferior Cornua of these Ventricles, forms thin puckered borders getting the name of *Corpora Fimbriata* ;—but, according to VIC D'AZYR, they are more properly termed

Tænia Hippocampi, from being united with the great Hippocampus.

The Body of the Fornix is *narrow* anteriorly, and becomes considerably *broader* behind, where it is incorporated with the Corpus Callosum.

The under Surface of the posterior part of the Body of the Fornix is impressed with numerous transverse and oblique Lines, which have been called *Psalterium*, or *Lyra*, from some resemblance they bear to the ancient musical instruments of these names.

The Body of the Fornix is joined above to the Septum Lucidum; and below, it is connected to the Thalami Optici by a Vascular Membrane, called *Tela Choroidea*, which spreads over the Thalami, and parts termed *Tubercula Quadrigemina* and PINEAL GLAND. Anteriorly it unites with the Choroid Plexus of the Lateral Ventricles; posteriorly it is continuous with the Pia Mater of the external part of the Brain.

The *Pedes Hippocampi*, *Cornua Ammonis*, or *Great Hippocampus*,—named from a supposed resemblance to these Bodies,—are two Medullary Eminences, which arise from the sides of the posterior extremity of the Corpus Callosum, and are situated in the inferior Prolongations of the Lateral Ventricles.

They run through the whole extent of these Prolongations, first behind, then at the outer part of the posterior Pillars of the Fornix, and are so intimately connected with them, that they have been considered by some Authors as forming part of the Pillars themselves.

They are small at their origin, from which they continue to increase to their farther extremity.

Like the greater part of the Ventricles, they are covered externally with a Medullary Lamina;—internally they are found to consist of Medullary and Cineritious Laminæ, which have a convoluted appearance.

At the inner edge of the Pedes Hippocampi, there is a *plated*, *serrated*, or *indented Margin*, which, in the generality of Quadrupeds, is much larger, in proportion to the size of the Brain, than it is in Man. The resemblance, however, to the Human kind, in the structure of this particular part of the Brain, is more striking in the Ape than in any other Quadruped.

In the bottom of the Lateral Ventricles, behind the anterior Crura of the Fornix, and before the meeting of the Choroid Plexuses of these Ventricles, below the anterior part of the Body of the Fornix, and over the fore part of the third Ventricle, there is a *Hole* of an *oval form*, by which the Lateral Ventricles communicate freely with each other. *See* MONRO's *Obs. on Nerv. Syst.* 1783, and *Treatise on the Brain*, 1797.

After dividing and turning back the Fornix, another communication from the above passage is found, called *Foramen Commune Anterius*, *Vulva*, or *Iter ad Infundibulum;* but properly, *Iter ad Tertium Ventriculum*, being a *Passage to the Third Ventricle.*

Between the Commissura Mollis of the Optic Thalami and Substance called *Pineal Gland*, there is a small passage termed *Anus*, or *Foramen Commune Posterius*, which has been supposed by some Authors to form a communication between the back part of the Third Ventricle and Lateral Ventricles; but it is completely closed up by the Tela Choroidea, and also by the Fornix, which is intimately connected to this.

The *Third Ventricle* is in form of a deep Fissure, placed between the inner ends of the Thalami Optici, having the Commissura Mollis of these Thalami situated above, the Crura Cerebri below, and the Bodies of the Thalami on each side.

The *Infundibulum*, formed of a Cineritious and Medullary Substance, is a passage of considerable size, which leads downwards and forwards, from the anterior part of the Third Ventricle; gradually contracting, and becoming solid at its under end, where it terminates in the *Glandula Pituitaria*, and thus, contrary to the opinion of the Ancients, preventing the passage of any Pituitous Fluid from it to the Nose.

The *Glandula Pituitaria* is of an oval form, but flattened above, and longest transversely; it is about the size of a Field-bean, is lodged in the Sella Turcica, and surrounded by a doubling of the Dura Mater.

On the outside, it is of a brownish colour, and formed of Cineritious Matter; it is whiter within, where it is mixed with Medullary Substance.

The Glandula Pituitaria was formerly supposed to absorb a Fluid from the Infundibulum, and transmit it to the Nose. It has been already mentioned, however, that the Infundibulum is impervious at its under end, and the real use of this Gland, as well as of the other Tubercles of the Brain, seems still unknown.

At the fore part of the Third Ventricle, and immediately before the Anterior Crura of the Fornix, there is a white Medullary Cord, which runs transversely through the Corpora Striata, and then downwards, having the name of *Commissura Cerebri Anterior*.

At the back part of the third Ventricle, and under the root of the Pineal Gland, there is another Cord similar to the former, but shorter, called *Commissura Cerebri Posterior*. The Commissuræ Cerebri assist in uniting the two sides of the Brain together.

From the under and back part of the third Ventricle, there is a Passage which leads to the fourth, under the name of *Iter ad Quartum Ventriculum*, *Canalis Medius*, vel *Aquæductus* SYLVII.

After the posterior part of the Fornix, and the Tela Choroidea to which it adheres, have been removed, there appear at the back part of the third Ventricle, behind the Thalami, and over the Iter a Tertio ad Quartum Ventriculum, the *Nates* and *Testes*, or *Tubercula Quadrigemina*, or more properly *Bigemina*, and the *Pineal Gland*.

The *Nates*, or *Tubercula Anteriora*, are placed uppermost, and are of a rounder form than the *Testes*, or *Tubercula Posteriora*, which lie immediately under the former.

The *Testes* are a little whiter in their colour than the Nates, and broader from one side to the other.

A Longitudinal Section shews the Tubercula to be covered externally with a thin Medullary Lamina, and to be Cineritious within.

In Man they are more nearly of an equal size and colour than in Quadrupeds, as in the Ox, Sheep, &c.

in which the Nates are large, round, and of a brown colour, and the Testes small and long, and have a white appearance.

Over the *Nates*, and connected to them by a thin Medullary Lamina, and under the back part of the *Fornix*, is placed the *Glandula Pinealis*, which is of a Cineritious nature, about the size of a Garden-pea, and of a Conoid Figure, placed almost horizontally, with its point backwards; obtaining its name from its resemblance in shape to a *Pine* or *Fir-cone*.

In consequence of its being always present, and seldom found in a diseased state, it has been celebrated by DES CARTES as the *Seat of the Soul.*

The *Pineal Gland* is fixed by its root to the Commissura Cerebri Posterior, and sends out *two long Medullary Peduncles*, or *Foot-stalks*, to be fixed to the upper and inner side of the Thalami, and the Anterior Crura of the Fornix.

Near, or in the Substance of the Pineal Gland, small Calcareous Concretions are frequently found; sometimes they are grouped together over the Base of the Gland, and then form the *Acervulus Cerebri* of SOEMMERRING.

They are not met with till after the age of puberty, and do not appear to be the effects of disease.

CEREBELLUM.

The *Cerebellum* is situated in the Inferior Fossæ of the Occipital Bone, under the Posterior Lobes of the Cerebrum, and is separated from these Lobes by the Tentorium.

It is somewhat of a roundish form, though a little flattened above, and about an inch broader from one side to the other than from before backwards. It is only about a sixth part of the size of the Cerebrum, and less complex.

It is divided behind by the Falx Minor into two Lobes or Hemispheres, which, like the Hemispheres of the Brain proper, have a general similarity to each other in the opposite sides of the Head, but it has no separation above, like that of the Cerebrum.

Its colour is similar to that of the Brain, and it is divided into numerous Circumvolutions, forming Arches in many parts, with their Convexities turned outwards, which decussate each other at sharp angles

The Circumvolutions run chiefly in a Lateral direction, and are formed of Laminæ, with Sulci between them, varying much in depth, into which, as in the Brain, the Pia Mater insinuates itself, and binds them together. This may be readily seen by making a Puncture into the Arachnoid Coat, and blowing in Air, till it distends the Cellular Substance, and separates the Coats from each other.

It has two middle Eminences, called *Appendices Vermiformes*, from their resemblance to Earth-worms, one of which is situated anteriorly or superiorly, the other inferiorly or posteriorly; or there is a Superior and an Inferior Vermiform Process.

Each of the Lobes of the Cerebellum is again divided into *Monticuli* or *Lobules*, which have different names according to their relative situations, connexions with other parts, &c. They vary a little in different

Subjects, but are easily distinguished from the direction of their Convolutions.

The Substance of the Cerebellum consists of Cineritious and Medullary Matter, as in the Cerebrum; but the Cineritious bears a greater proportion to the Medullary in the former than in the latter.

When the Cerebellum is cut in a longitudinal Vertical direction through its middle, the Medullary part is then found to bear a striking resemblance to the branching of the Shrub called *Arbor Vitæ:* from which circumstance it has obtained the name of that Shrub.

When cut in slices nearly parallel to the base of the Brain, the Medullary Substance appears in Laminæ corresponding to those of the Surface of the Cerebellum; and when cut to a considerable depth, or when the Laminæ are removed, there is, as in the Cerebrum, a Centrum Medullare, somewhat of the form of the entire Cerebellum, consisting of a middle and two lateral portions.

If the Cerebellum be cut vertically a little from its middle, and the incision carried forwards and inwards, as far as the Tuber Annulare, a small quantity of Cineritious Substance is seen, with an indented border, which partially incloses a quantity of Medullary Matter, and has got the name of *Corpus Dentatum*, vel *Rhomboideum*. This Substance is found to be the only Cineritious part in the Centrum Medullare.

Between the Cerebellum, the under and back part of the Tuber Annulare, and upper and back part of the Medulla Oblongata, the *Fourth Ventricle* is situated, which extends from the *Testes* to the posterior-inferior Notch of the Cerebellum formed by the Falx Minor.

A little lower than the Testes, the Ventricle becomes wider, and forms an Angle behind, from which again it contracts, and, becoming narrower and pointed below like a writing-pen, it has got the name of *Calamus Scriptorius.*

Over the under end of the Aquæductus SYLVII, and upper part of the Fourth Ventricle, there is a thin Medullary Lamina, called *Valvula,* but properly *Velum* VIEUSSENII.

At the sides of the Velum VIEUSSENII, there are two Medullary Tracts, called *Processus ad Testes,* or *Columnæ Valvulæ* VIEUSSENII.

The under end of the Ventricle is found to be shut up by its Choroid Plexus, which prevents any communication between this Cavity and that of the Spine.

UNDER SURFACE OF THE BRAIN.

Upon inverting the Brain, the Lobes already taken notice of appear in a conspicuous manner, their form, and irregularities of their Surface, corresponding with the inner Surface of the Base of the Cranium.

At the fore part of the Brain, the Fissure between the Hemispheres extends a considerable way back between the anterior Lobes.

Behind this Fissure is observed the union of the Optic Nerves which are to be afterwards described.

Near the middle of the Base of the Brain, and between its Lateral Lobes, there are two small, round, white Bodies, termed *Eminentiæ Mammillares,* vel *Corpora Albicantia,* Medullary without, and Cineritious within, mistaken by some Authors for Glands.

In the Corpora Albicantia, various Medullary *Strata* terminate, which come from different parts of the Brain.

Immediately before the Corpora Albicantia, is seen, the Infundibulum, leading from the third Ventricle.

On the outside of the Corpora Albicantia, two white Cords, about three quarters of an inch in diameter, are observed, called *Crura*, vel *Pedunculi Cerebri*, vel *Crura Anteriora Medullæ Oblongatæ*, which arise from the Medullary Substance of the Brain, and gradually approach each other in their course, till they unite with the Tuber Annulare.

Their Surface is flat, and composed of distinct longitudinal Medullary Fibres, with Grooves between them. Internally they are formed of a mixture of Cineritious and Medullary Matter, the former of which being of a darker colour at one particular part than in any other of the Brain, has been termed *Locus Niger Crurum Cerebri*.

Between the Crura Cerebri, and likewise between the Corpora Albicantia, there is a Cineritious Substance, called *Pons* TARINI, which joins these Bodies of the opposite sides together, and assists in forming the bottom of the third Ventricle.

From the Medullary part of the Cerebellum, which forms the Trunk of the Arbor Vitæ, two large white Cords also arise, under the name of *Crura Cerebelli*, vel *Crura Posteriora*, vel *Pedunculi Cerebelli*, which unite with the Crura Cerebri, to compose the *Tuber Annulare*, vel *Pons* VAROLII, so named from forming a Ring or Bridge over the Crura. This Ring is intimately incorporated with, and formed by, these Crura.

The *Tuber Annulare* is situated over the back part of the Body of the Sphenoid, and Cuneiform Process of the Occipital Bones. It is of a roundish form, or it approaches somewhat to that of a Cube with rounded corners, and measures upwards of an inch, whether taken in a longitudinal or transverse direction.

Many Transverse Streaks and Furrows run on its Surface, and it is divided into two lateral parts by a longitudinal Depression, occasioned by the situation of the Vertebral Artery.

At the fore and back parts of the Tuber, and at the extremities of the depression made by the Vertebral Artery, are the *Foramina Cæca, Anterius et Posterius*, the former placed between the Nerves of the Third, and the latter between those of the Sixth Pair. These two Foramina penetrate only a little way into the edges of the Tuber, and receive a Plexus of Vessels.

The Substance of the Tuber is intermixed with a considerable quantity of Cortical Matter, formed into *Striæ* running in different directions, the Striæ appearing more or less distinct, according to the course of incisions which may be made.

Continued from the Tuber, there is a large Substance in form of an inverted Cone, which extends to the Foramen Magnum of the Occipital Bone, under the name of *Medulla Oblongata*, which forms the beginning of the Spinal Marrow.

The Medulla Oblongata has a longitudinal Fissure before, and another behind, dividing it into two lateral Portions or Cords, having the name of *Anterior* and *Posterior Median Fissures.*

Upon the anterior Surface of the Medulla Oblongata two small Eminences appear, which run longitudinally, and contiguous to each other, and, from their shape, have the name of *Corpora Pyramidalia*, vel *Eminentiæ Pyramidales*.

Between the Corpora Pyramidalia, the Anterior Median Fissure is deep, where the Pia Mater penetrates, and where the Blood-vessels pass into the anterior part of the Medulla.

At the outside of the former Eminences, are two others, somewhat of the figure of Olives, from which they are termed *Corpora Olivaria*, vel *Eminentiæ Olivares*.

Within the Corpus Olivare, on each side, there is a thin Capsule of Cineritious Substance running from above downwards, inclosing Medullary Matter, and named by VIC D'AZYR, the *Corpus Dentatum* vel *Rhomboideum* of this Substance.

More externally than the Corpora Olivaria, and occupying the whole remaining part of the Cord round to the posterior Median Fissure, are other two Eminences, less evident than the last, which have been described by some Authors under the names of *Corpora Pyramidalia Posteriora*, *Corpora Restiformia*, *Peduncles of the Medulla Oblongata*, &c.

The two lateral Portions of the Medulla Oblongata are formed of Medullary Matter without, and a large proportion of Cineritious Matter within, joined together by Medullary Fibres.

When the Corpora Pyramidalia of the Medulla are separated some way from each other, after being steeped in a coagulating liquor, there is an appearance of a decussation of Fibres from the opposite sides. These apparent Fibres DRS GALL and SPURZHEIM arrange into two systems, and attempt to trace them through the various parts of the Brain, under the names of *Diverging* and *Converging Apparatus* of Fibres: thus considering the Medulla Oblongata as giving origin to the Brain, instead of the Brain being the source of the Medulla Oblongata, and other parts of the Nervous System in general. Upon this subject consult DR GORDON's Observations on the Structure of the Brain.

The Arteries of the Brain are derived from the Internal Carotids and Vertebrals, and run in a tortuous manner through the Base of the Cranium, to prevent the Blood from rushing too violently into the Brain.

The Veins, as formerly mentioned, only differ from those of other Viscera in being more tender, and in not following the course of their respective Arteries.

The BRAIN is the GRAND AND PRIMARY ORGAN OF SENSE, *with which the Mind is supposed to be most immediately and intimately connected, and from which the Nervous Influence is found, by experiment, to be communicated to all the other parts of the Body.*

ORIGIN *of the* NERVES.

The Nerves arise from, or are connected with, the Medullary parts of the Brain, some in solid Cords, others in separate Threads, which afterwards unite into Cords, and have their names in numerical succession, according to their situations,—beginning anteriorly.

Nine or ten Pairs are connected with the Brain, besides a Pair termed Sympathetic.

The *First*, or *Olfactory Pair of Nerves*, arise from the back part of the Anterior Lobes of the Brain, and run towards the Cribriform Plate of the Ethmoid Bone, where each forms a brownish-coloured Bulb, from which numerous small Nerves are sent off.

The *Second Pair*, or *Optic Nerves*, are the continuation of the Thalami Optici. They are united immediately under the Infundibulum, and form what has been called the *Union*, the *Decussation*, or the *Commissure* of the Optic Nerves. Here there is an intimate intermixture of parts, and the Nerves again separate, previously to their passing into the Orbits.

The *Third Pair* arise from the Crura Cerebri by numerous Threads, which are soon collected into Trunks.

The *Fourth Pair*, which are the smallest Nerves of the Body, arise behind the Testes, and have a long winding course.

The *Fifth Pair*, which are the largest Nerves in the Brain, have each an anterior small, and a posterior large Fasciculus, arising from the sides of the Tuber Annulare.

The *Sixth Pair* arise from the beginning of the Medulla Oblongata, where it joins the Tuber Annulare. Each of the Nerves of this Pair has a small Thread at its inner part.

The *Seventh Pair* arise from the beginning of the lateral parts of the Medulla Oblongata, and are divided on each side into a *Portio Mollis* and *Portio Dura*.

The *Eighth Pair* arise by small Fasciculi from the Corpora Olivaria.

The *Ninth Pair of Nerves* also arise by small Fasciculi a little below the former, from the Corpora Pyramidalia.

The Origin of the Nerves is described at greater length in Vol. III.

TAB. XVIII.

Fig. 1.

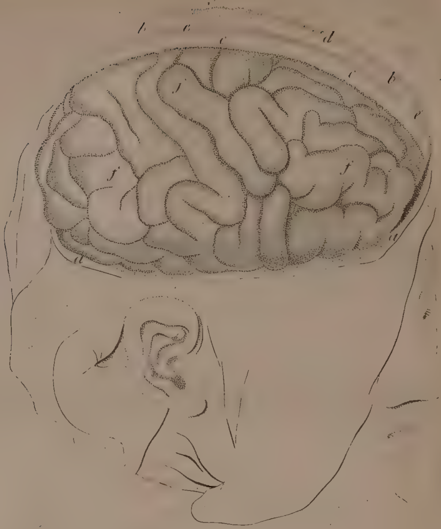

Fig. 2.

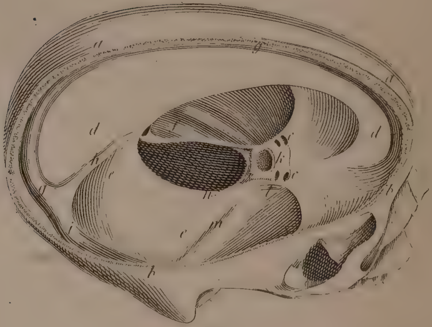

Fig. 3.

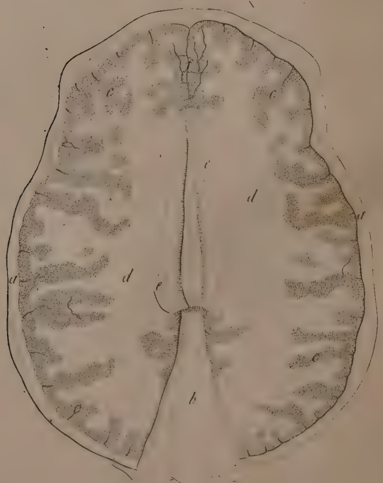

TABLE XVIII.

VIEWS of the BRAIN and its MEMBRANES.

FIG 1.

After turning down the INTEGUMENTS, *and raising the* SKULL-CAP, *the* DURA MATER *is shewn at the Upper Part of the Figure. On the Right Side, that Membrane is raised to shew the* PIA MATER, *with the* CONVOLUTIONS *of the* BRAIN *shining through it.*

a, a, The cut edge of the cranium.

b, b, Part of the dura mater which covers the left hemisphere of the brain.

c, c, A portion of the dura mater covering the right hemisphere.

d, Some of the small pits commonly occupied by the glands of PACCHIONI.

e, e, The course of the superior longitudinal sinus.

f, f, The third hemisphere of the brain, covered by the tunica arachnoidea and pia mater, and divided into convolutions, which appear of different sizes and lengths in different parts of the figure.

FIG. 2.

A SECTION *of the* CRANIUM, *giving a View of the Principal* PROCESSES *and* SINUSES *of the* DURA MATER.

a, a, The cranium cut in a vertical direction, a little to the right side of the falx.

b, b, The right side of the cranium cut horizontally, a little above the tentorium.

c, c, The foramina optica, behind which are the cut ends of the carotid arteries.

d, d, The falx adhering at its anterior extremity to the spine of the frontal bone, and crista galli of the ethmoid one.

e, e, The right side of the tentorium.

f, The left side of that membrane. Between the two sides of the tentorium the foramen ovale appears, where the tuber annulare was chiefly seated.

g, g, The superior longitudinal sinus.

h, The torcular HEROPHILI, or fourth sinus, at its anterior extremity receiving the inferior longitudinal sinus, which runs along the under end of the falx.

i, The right lateral sinus, the left being concealed.

k, The circular sinus, surrounding the sella Turcica.

l, The seat of the right cavernous sinus.

m, The superior petrosal sinus.

n, The inferior petrosal sinus, in its way to the end of the lateral sinus.

FIG. 3.

Gives a View of a Transverse SECTION *of the* BRAIN *upon a level with the* CORPUS CALLOSUM, *or near the Middle Height of the* BRAIN.

a, a, The cranium, sawed at its greatest diameter.

b, The dura mater turned.

c, c, c, c, The cortical or cineritious part of the convolutions of the brain, with fissures running between the convolutions.

d, d, The medullary part of the brain forming the centrum ovale.

e, e, The corpus callosum, with a *raphè* in its middle, on each side of which is a longitudinal cord, and farther out, transverse streaks of medullary matter.

f, Arteries which were placed upon the corpus callosum, now drawn towards the fore part of the brain.

TABLE XIX.

VIEWS of the BRAIN.

FIG. 1.

The Right Side exhibits a deeper SECTION *than that shewn in* Tab. XVII. Fig. 3. *and the Left one a* SECTION *still deeper than that of the Right Side. The* CEREBELLUM *is cut in a vertical direction from before backwards, and the Lateral Parts turned a little outwards.*

RIGHT SIDE.

a, *a*, The cut edges of the cranium.

b, The frontal sinus, with its opening into the nose.

c, *c*, The cut edges of the convolutions of the brain, with the fissures between them.

d, The fissure which separates the anterior lobes of the brain.

e, The corpus striatum, placed in the fore part of the lateral ventricle.

f, The anterior cornu of the lateral ventricle.

g, The septum lucidum.

h, The posterior pillar of the fornix, the anterior being concealed by the septum lucidum.

i, The back part of the corpus callosum, joined to the fornix and septum lucidum.

k, The choroid plexus of the lateral ventricle, placed over, and concealing a large share of, the thalamus nervi optici.

l, The tænia, or centrum semicirculare geminum.

Fig. 1.

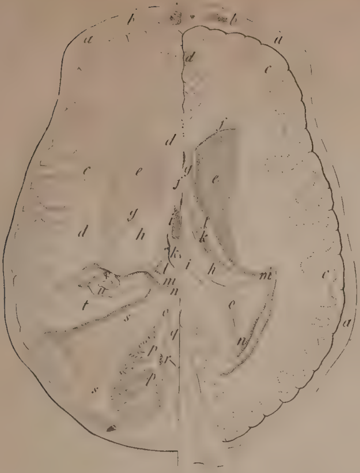

Fig. 2.

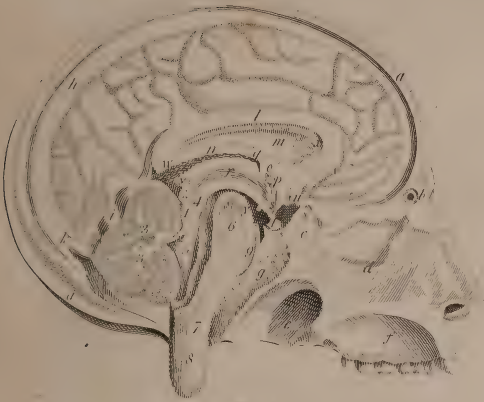

Fig. 3.

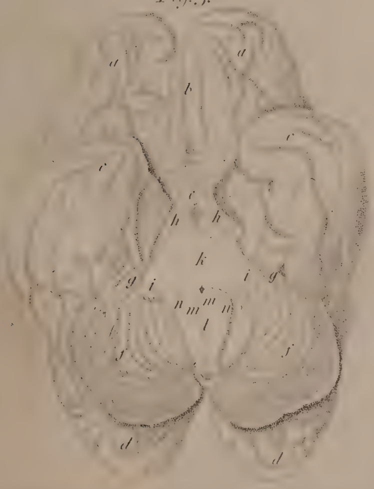

TABLE XIX. CONTINUED.

m, The beginning of the inferior cornu of the lateral ventricle.

n, The posterior cornu of that ventricle.

o, The hippocampus minor, or small elongation placed in the posterior cornu.

LEFT SIDE.

a, *b*, *c*, As on the right side.

d, *d*, The medullary part of the brain, which surrounds,

e, The corpus striatum.

f, A section of the anterior pillar of the fornix.

g, The tænia semicircularis.

h, The thalamus opticus.

i, The cavity of the third ventricle, at the fore and back parts of which are observed two white lines, representing the anterior and posterior commissures of the brain.

k, The left half of the pineal gland, with its corresponding peduncle passing forwards at the inner edge of the thalamus opticus.

l, One of the nates.

m, The corresponding testis.

n, A medullary lamina between the testes and valve of VIEUSSENS, which covers the passage to the fourth ventricle.

o, One of the two medullary tracts, called *Processus ad Testes*, or *Columnæ Valvulæ* VIEUSSENII.

p, *p*, The medullary part of the cerebellum, termed *Arbor Vitæ*.

q, The fourth ventricle, in the bottom of which is the furrow called *Calamus Scriptorius*.

FIG. 3.

A VIEW *of the* BASE *of the* BRAIN.

a, *a*, The anterior lobes of the brain.

b, The division of the anterior lobes, on each side of which is a groove, where the first pair of nerves were situated.

c, *c*, The lateral lobes, separated from the anterior by the fissures of SYLVIUS.

d, *d*, The posterior lobes.

e, The infundibulum, placed behind the union of the optic nerves, and before the corpora albicantia.

f, *f*, The cerebellum, divided into its two lobes or hemispheres.

g, *g*, The superior and anterior lobules, called also the superior and inferior *vermiform processes* of the cerebellum.

h, *h*, The crura cerebri.

i, *i*, The crura cerebelli.

k, The tuber annulare, in the middle of which is an impression made by the basilar artery.

l, The medulla oblongata, composed of two lateral portions, with a fissure between them.

m, *m*, The corpora pyramidalia.

n, *n*, The corpora olivaria.

TAB. XX.

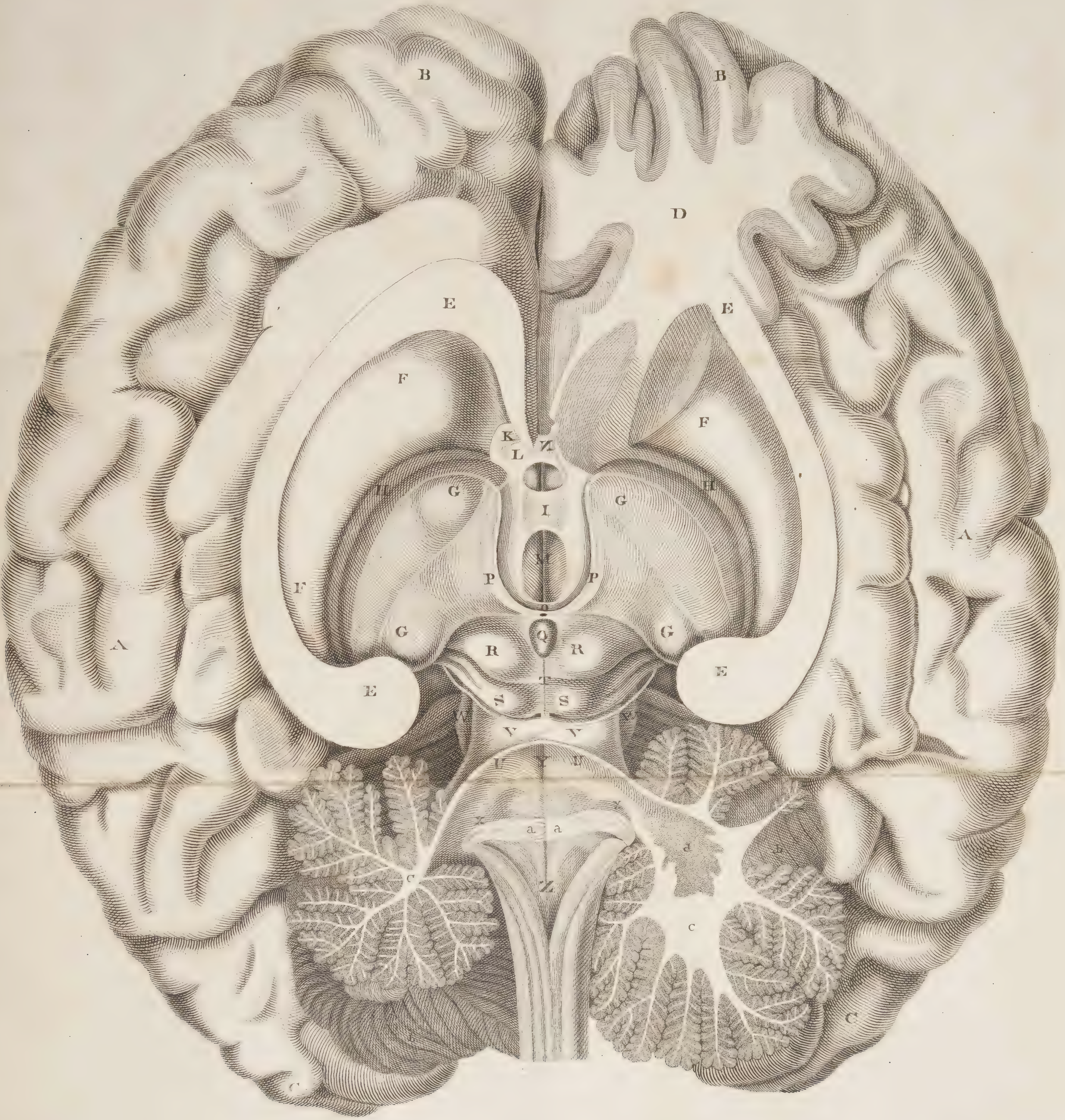

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TABLE XX.

SHEWS the BRAIN placed upon its BASE.—A Cut is made in a vertical direction through the middle of the Corpus Callosum, as far as the Anterior Commissure, and continued posteriorly to the Tubercula Quadrigemina. The Hemispheres are separated from each other, and turned to each side. The Septum Lucidum and Fornix are cut and removed. The Cerebellum, in a similar manner, is divided as far as the Fourth Ventricle. In the Left side, a Vertical Section is seen; in the Right, the parts are cut horizontally.

A, A, The hemispheres of the brain.

B, B, The anterior lobes.

C, C, The posterior lobes.

D, A vertical section of the fore and inner part of the right hemisphere, to shew the cortical and medullary parts.

E, E, The cut edges of the corpus callosum, between which parts the lateral ventricles are included.

F, F, The corpora striata. In the right corpus, a band of medullary striæ are seen.

G, G, The thalami nervorum opticorum, on which their eminences or tubercles distinctly appear, and also some medullary striæ running in a curved direction.

H, H, The centrum semicirculare geminum.

I, The commissura mollis of the optic thalami.

K, The remains of the septum lucidum.

L, Section of anterior commissure of the brain.

M, The third ventricle.

N, Part of the infundibulum.

O, The posterior commissure of the brain.

P, P, The peduncles, or superior cords of connexion of the pineal glands with the thalami.

Q, The pineal gland.

R, R, The nates, or anterior part of the tubercula quadrigemina.

S, S, The testes, or posterior pair.

T, The commissure of the tubercula quadrigemina.

U, U, V, V, The valvula VIEUSSENII, or mass of connexion between the tubercula and the cerebellum.

W, W, The tuber annulare.

X, X, Y, Z, The fourth ventricle. Y, Z, The linea media of this ventricle. Z, The under part of this, termed *Calamus Scriptorius.*

a, a, Medullary striæ in the fourth ventricle, which form the beginning of the auditory nerves.

b, b, The outer surface of the cerebellum.

c, c, The medullary part of the cerebellum, forming the trunk of the arbor vitæ.

d, The corpus denticulum vel rhomboideum of the cerebellum.

OF THE EYE.

THE *EYES*, which constitute the Organ of Vision, are situated in the Cavities of the Orbits, and are surrounded by several parts, some of which protect them from injury, and others assist in the performance of their various motions.

The *Orbits* are of a conical figure, situated in the fore part of the Cranium, with their Apices behind, their Axes in a horizontal direction, and their Bases turned obliquely outwards.

They are formed of different Processes of the following Bones, viz.

The upper part of each Orbit, by the Orbitar plate of the Frontal Bone;—the inferior, by the Orbitar Plates of the superior Maxillary and Malar Bones;—the internal, chiefly by the Orbitar part of the Os Unguis and Pars Plana of the Ethmoid Bone;—the external, by the Orbitar Plates of the Sphenoid and Malar Bones;—the posterior, by the Sphenoid and Palate Bones;—and the anterior edge of the Orbit, by the Frontal, Superior Maxillary, and Malar Bones.

The Cavities of the Orbits are lined with Productions of the Dura Mater, which pass through the Foramina Optica and Lacera; and, at the anterior edges of the Orbits, join the Periosteum of the Face, where they supply the place of Ligaments to the Palpebræ.

SUPERCILIA.

The *Supercilia*, or *Eye-brows*, which are peculiar to the Human Species, are the Arches of Hair situated upon the Superciliary Ridges of the Frontal Bone. The Hairs are placed obliquely, with their roots towards the Nose, and the Arches elevated a little above the rest of the Fore-head, by a considerable quantity of Cellular Substance lying under the Skin.

They are moved in different directions by the action of the Occipito-frontalis, Corrugator Supercilii, and Orbicularis Palpebrarum.

They are intended partly for Ornament, and partly as Shades over the Eyes, thereby preventing them from being injured by extraneous matter, or by too great a degree of light. They also assist in expressing the Passions.

PALPEBRÆ.

The *Palpebræ*, or *Eye-lids*, are chiefly composed of a Doubling of the Skin inclosing the Cartilages called *Tarsi*, and a portion of the Orbicularis Palpebrarum; and form Angles at their outer and inner extremities, termed *Canthi*, or *Corners of the Eye.*

The Eye-lids are covered by the Common Integuments, which are much thinner here than in most of the other parts of the Body, and are destitute of Subcutaneous Fat. They are connected to the anterior edge of the Orbits by Cellular Substance condensed, which assists in the formation of what have been called *Ligaments* of the Palpebræ.

The *Upper Eye-lid* is the larger of the two, and is the one which moves principally in closing or opening the Eye.

The *Motions* of the Eye-lids are performed by the actions of the Orbicularis and Levator Palpebræ Superioris. The under Eye-lid is raised by that part of the Orbicularis belonging to it. It is depressed by its own elasticity.

The Eye-lids serve as curtains or veils, to defend the Eyes during Sleep. They likewise prevent them from being injured by extraneous objects, or by too much light. In certain situations, they assist vision, by diminishing the rays of light when they are too strong. By their frequent motion, they increase the secretion of the Tears, apply them properly to the Surface of the Eye, and conduct what remains, after washing the Eye, to the Puncta Lacrymalia.

TARSUS.

This is a *thin Cartilaginous Arch,* situated in the edge of each Eye-lid; that in the upper one being considerably broader than the one below, and each broader at its middle than towards its extremities.

The Tarsi terminate at a little distance from the inner Angle of the Eye.—Their edges are so formed, that when the Eye-lids are shut, a Groove is left next the Eye, by which the Tears are conveyed towards the Nose.

The Tarsi serve to keep the Eye-lids extended, allow them to be accurately applied to each other, and prevent them from being collected into Folds.

GLANDULÆ SEBACEÆ, CILIARES, vel MEIBOMIANÆ.

The last term is obtained from these Substances being described by MEIBOMIUS. They are situated between the Tarsus and lining of the Eye-lids, and are formed of a series of white Lines or Follicles, running across the Tarsus in serpentine directions, and, when viewed through a Magnifier, appearing like Rows of Pearls. From their Substance an Oily or Sebaceous Matter, resembling little Worms, may be readily squeezed out through the Foramina or Puncta Ciliaria, placed upon the edges of the Eye-lids.

The Matter of the Sebaceous Glands anoints the edges, and facilitates the motions of the Eye-lids; it likewise prevents their Accretion, or the Tears from passing over them during Sleep.

CILIA.

The *Cilia,* or *Eye-lashes,* are stiff Hairs placed in the edges of the Eye-lids. Those of the Upper Eye-lid are bent upwards, and are considerably longer than those of the Under one, which are bent in the opposite direction. In both Eye-lids they are wanting near the inner Angle.

The Cilia prevent dust, insects, &c. from getting into the Eye, assist in moderating the quantity of light sent into it, and add considerably to the beauty of the Face.

GLANDULA LACRYMALIS.

The *Glandula Lacrymalis,* called, till of late years, *Glandula Innominata* GALENI, is situated within the Orbit, upon the upper and outer part of the Eye, in a hollow behind the outer end of the Superciliary Ridge of the Frontal Bone.

It is a lobulated Gland, or one of the Conglomerate kind. Is of a yellowish white colour, of an oblong form, and a little flattened. Has one end pointing to the Nose, the other to the external Angle of the Eye, and is fixed to the outer part of the Orbit by a small Ligament.

Besides the Glandula Lacrymalis, there is a chain of *smaller Glands,* lying between it and the upper Eye-lid, and connecting them together.

In the direction of the smaller Glands there are six or seven Excretory Ducts,—described by DR MONRO, 1758,—which run nearly parallel to, but do not communicate with each other.

The Excretory Ducts, on account of their smallness, are not often seen, and are injected with difficulty. They terminate on the inner side of the upper Eye-lid, near the outer Angle of the Eye and upper edge of the Tarsus.

The use of the Lacrymal Gland is to secrete the Tears, which are spread over the Surface of the Eye by their own weight, and by the motion of the Eye-lids, for the purpose of preserving the delicacy of the Eye, and particularly the transparency of the Cornea.

PUNCTA LACRYMALIA.

The *Puncta Lacrymalia* are two small Orifices placed near the inner Angle of the Eye, one in the upper, the other in the under Eye-lid, at the extremity of the Tarsus, and opposite to each other.

Each Punctum is seated obliquely upon a little eminence, and is surrounded by a Cartilaginous Circle, which keeps it constantly open.

The Puncta Lacrymalia are the Orifices of two small Canals, which have been termed *Cornua Limacum.* These, after going a little across at their beginning, make a sharp Angle, and run in the direction of the edges of the Eye-lids towards the side of the Nose, where they approach each other. They terminate together, sometimes by a common Duct, but more frequently by distinct openings, in the Lacrymal Sac, which will be described under the article Nose.

The Tears which remain after moistening the Eye are absorbed by the Puncta, after the manner of Capillary attraction, and are conveyed through their Ducts into the Lacrymal Sac by the impulse of the Eye-lids.

The Tears are transparent, colourless, and saltish to the Taste; and consist of Water and Mucus, mixed with a small proportion of Saline Matter.

CARUNCULA LACRYMALIS.

The *Caruncula Lacrymalis* is a small Gland of a reddish colour, and of the conglomerate kind; situated between the inner angle of the Eye-lids and Ball of the Eye. It supplies Sebaceous Matter to this part of the Eye-lids, and serves in particular to separate the Puncta Lacrymalia, and keep them open, directing the Tears to them while the Eye-lids are shut.

Minute Hairs are found upon the surface of this Body, serving to entangle small objects which get into the Eye.

VALVULA SEMILUNARIS.

The *Valvula Semilunaris* is a small doubling of the Tunica Conjunctiva, and lies between the Caruncula Lacrymalis and Ball of the Eye.

It is larger in an Ape and other Quadrupeds than in the Human Species, and still larger in Birds, in which, as well as in Quadrupeds, it is called *Membrana Nictitans*, vel *Palpebra Tertia*.

It is in form of a Crescent, the Horns of which are turned towards the Puncta Lacrymalia, and assist the Caruncula in conducting the Tears to the Puncta.

BALL OF THE EYE.

The *Ball*, *Globe*, or *Bulb* of the Eye, is of a spherical form, to collect the rays of light into a proper Focus, and is surrounded behind by a quantity of soft Fat, to allow the Eye and its Muscles to move with facility.

It is composed of *Coats*, *Humours*, *Vessels*, and *Nerves*, to be next described.

COATS.

TUNICA ADNATA.

The *Tunica Adnata*, vel *Conjunctiva*, named from its connecting the Eye to the Orbit, is a reflection of the Skin continued from the Eye-lids, over the whole fore part of the Ball of the Eye.

It adheres slightly, by means of Cellular Substance, to the white of the Eye, but so firmly to the Cornea, as to be separated from it with difficulty till after maceration.

It is so remarkably thin, that the colour of the subjacent parts appears readily through it.

Between this Coat and the white part of the Eye, there is a quantity of loose Cellular Substance, which is very Vascular, and is the common seat of *Ophthalmia.*

The Tunica Adnata supports the Ball of the Eye, prevents extraneous Bodies from getting to the back part of it, and forms a smooth covering to lessen the friction between the Eye and Eye-lids.

CORNEA.

The *Cornea*, so called from its resemblance to Horn, is termed by many Authors *Cornea Lucida*, to distinguish it from the Sclerotica, which these Authors called *Cornea Opaca*.

It forms the anterior Pellucid Covering of the Eye, is more convex than the rest of the Ball, but is not quite circular. It is joined to the Tunica Sclerotica, like the Segment of a small Sphere to that of a larger one. The convexity, however, varies in different persons, so as to form a short or long sighted Eye, according as the Cornea is more or less prominent. It is found also to become more convex when we look at near objects, and the reverse when we view those at a distance. In the former case, the convexity of the Fore part of the Eye may be so much increased, by making the Eye-lids approach each other, as to answer the purpose of a convex Glass.

In a recent Subject, it is hard, dense, and transparent, but after maceration in water, it becomes soft and opake, and may be readily separated, especially in young Animals, into different Lamellæ, the anterior of which is the continuation of the Tunica Adnata.

By a slight degree of putrefaction, it may also be separated from the Tunica Sclerotica.

In a Whale, the edge of the Cornea is received into a distinct Groove, formed by the Sclerotica. Something of the same kind takes place in the Human Body; but, in the latter, the Sclerotic overlaps more of the anterior than the posterior edge of the Cornea.

In a sound state, the Cornea has no Vessels which carry red Blood, though they are frequently seen on it when the Eye is inflamed.

Its nerves are too small to be traced; yet it possesses exquisite sensibility.

It collects the rays of light, and transmits them to the Eye, protects the tender parts within it, and contains the Aqueous Humour.

IRIS.

The *Iris*, so named from its various colours, is the only Coat of the Ball of the Eye which possesses motion. It was considered as a continuation of the Choroid Coat, until described by ZINN, who shews that it is only connected to this Coat by the medium of the Ciliary Circle.

It is placed at a little distance from the Cornea, begins a small way behind the junction of that coat with the Sclerotica, and, running across, it forms a Septum, a little convex anteriorly, and perforated in the middle by a Hole called the *Pupil* or *Sight* of the Eye; the former term applied, because it represents objects no larger than a Pupilla or Puppet.

In a Fœtus, the Pupil is occupied by a Vascular Membrane, termed *Membrana Pupillaris*, which generally disappears between the seventh and ninth month of gestation.

Upon the back part of the Iris, there is a dark coloured Pigment or Varnish, considered by the Ancients as a posterior Layer of the Iris, and called by them *Uvea*, from its resemblance in colour to a Grape.

When the paint is washed off, the Iris exhibits two sets of Fibres, concerning which Authors have entertained various opinions; one set of Fibres in the form of

Radii, the different colours of which give the diversity of colour to the Eye; the other Circular, surrounding the inner edge of the Iris, and considered by the late DR MONRO as the Sphincter Muscle of the Pupil.

The colour of the Iris corresponds in general with that of the Hair, being blue or grey where the Hair is light, and brown or black where the Hair and Complexion are of a dark colour.

The Iris has also many Blood-vessels, which are rendered evident by Injection; and is furnished with a greater proportion of Nerves than almost any other part of the Body.

It floats in the Aqueous Humour, and is of such a nature, that, on exposure to a strong light, or when the Eye looks upon a near object, the diameter of the Pupil is diminished; and *vice versa*.

The different motions of the Iris in Man and the generality of Animals are involuntary, and are supposed to be excited by the sensibility of the Retina, and by the quantity of light which falls upon that Nerve, the light having no direct effect upon the Iris itself.

The Iris serves to regulate the quantity of light sent to the bottom of the Eye.

TUNICA SCLEROTICA.

The *Tunica Sclerotica*, which is named from its hardness, is the largest and strongest Coat of the Eye, covering the whole Ball, excepting the parts occupied by the entrance of the Optic Nerve behind, and by the Cornea before.

It covers the edge of the Cornea, and is so firmly fixed to it, that it has been considered by many Anatomists as a continuation of the same substance; but it differs from the Cornea, in the following particulars: —it is opake, and of a pure white colour; is formed of elastic Fibres running in every direction, and closely interwoven with each other, and is not divisible into Layers.

It is thicker in its posterior than anterior part, and receives a little tinge, on the inner Surface, from the Choroid Coat, with which it is in contact. It has few Blood-vessels when compared with the Choroides, and does not possess very acute sensibility.

It gives form and strength to the Eye, attachment to its Muscles, and protects and supports the tender parts it incloses. It has also been conjectured, and BLUMENBACH thinks he has ascertained from Comparative Anatomy the truth of the conjecture, that this Coat, by its structure, is so affected by the action of the Muscles, as to influence what are called the *Internal Changes of the Eye*; by which the form of the Eyeball, consequently the length of its Axis, and the respective situation of the Lens, are adjusted according to the proximity or remoteness of the object.

The Tendons of the four Recti Muscles of the Eye are fixed to the fore part of the Tunica Sclerotica. These, or the Cellular Vaginæ covering them, have been supposed to give an additional whiteness to the Eye, and the part giving this whiteness has been termed *Tunica Albuginea*:—But the Sclerotic Coat is every where of a pure white, and can receive little additional brightness from any such covering.

TUNICA CHOROIDES.

The *Choroides* lies under the *Sclerotica*, and is connected to it by the Trunks of Vessels and Nerves which pass from the one Coat to the other, and also by a tender Cellular Substance, of a brown colour, which tinges the inner Surface of the Sclerotica.

It begins at the entrance of the Optic Nerve into the Eye, runs between the Sclerotica and Retina, nearly to the Crystalline Lens, where it is more firmly connected to the Sclerotic Coat than it is elsewhere, by means of the Ciliary Circle.

The *Ciliary Circle*, or *Ciliary Ligament* as it is called, is composed of a quantity of condensed shining Cellular Substance, which forms a white Ring connecting the fore part of the Choroides, and the Root or outer margin of the Iris, to the Sclerotica.

At the inner side of the Ciliary Circle, is the *Canal* of FONTANA, which is of a Triangular Shape, and is partly formed by the Groove at the inner edges of the Cornea and Sclerotica.

The Choroid Coat is much thinner and more tender than the Sclerotic, and is one of the most Vascular parts of the Body, seeming at first sight to be entirely composed of Vessels.—The greater number of those on the outside run in whirls; while those on the inside, taking a direction forwards and nearly parallel to each other, gave rise to the supposed existence of the *Membrana* RUYSCHIANA.

It is also furnished with numerous Nerves, which are united with its Vessels by a fine Cellular Texture, and are seen running forwards flat, and in a parallel direction upon its outer Surface.

In the Human Eye, the Choroides is of a dusky brown colour, both externally and internally; but the colour varies considerably in the Eyes of different Animals.

The inner Surface of this Coat, which is *Villous*, was described by RUYSCH as a *distinct Lamina*, and has been termed by many Anatomists *Tunica* RUYSCHIANA. —But HALLER, ZINN, and many others who followed them, have demonstrated this Coat to consist of only one Lamina; though in Sheep, and some of the larger Animals, it appears to be double.

Upon the inner side of the Choroides, there is a Mucus, the colour of which, in different Animals, is found to have some connexion with the general colour of the Hair and Skin, though commonly, in the Human Body, it is of a brownish black, and termed *Pigmentum Nigrum;* the darkness of the shade, however, still corresponding with that of the Hair, as appears very evident in Negroes.

It is supposed to be produced from the Vessels of this Coat, and is blackest and thickest at the fore part of the Eye, where it adheres so tenaciously as to be removed with difficulty; but behind it is thinner, more fluid, and more easily removed; becoming gradually less evident towards the Optic Nerve, around which it almost disappears.

In advanced age, the Pigmentum Nigrum becomes more diluted, and of a lighter colour, so that the Vessels of the Choroid Coat may be seen shining through the Vitreous Humour.

Though HALLER denies that the *Membrana* RUYSCHIANA can ever be separated, in the Human Eye, from the Choroides,—he retains the name, to denote the Black Surface of this Coat.

In Gramenivorous Animals, and in those which go in quest of prey in the night, the Pigmentum is of a light and shining colour in the bottom of the Eye, and is called *Tapetum.*

In some entirely white Animals, as the white Rabbit, the Paint is wanting, or transparent, and the Eye has a red colour, from the Vessels of the Choroid Coat being seen in its bottom; but the redness disappears when the Animal is dead. In the Albinos also, and white Persons born of Negro Parents, the Pigmentum Nigrum is entirely or nearly deficient, and a red colour appears in the bottom of the Eye.

The fore part of the Choroid Coat, opposite to the Ciliary Circle, forms a black radiated Ring, called *Corpus Ciliare,* which is about the sixth part of an inch in breadth towards the Temple, but somewhat narrower towards the Nose.

In the posterior portion of the Corpus Ciliare, there are numerous pale radiated *Ciliary Striæ,* but so covered by the Pigmentum Nigrum, as not to be distinctly seen till the Paint is removed.

Near the connexion of the Corpus Ciliare with the root of the Iris, these Striæ become gradually broader and more elevated, and form white *Plicæ* or *Folds,* about seventy in number, termed *Processus Ciliares,* the intervals of which are also covered by the Pigmentum Nigrum.

The *Processus Ciliares* are commonly formed, each of two or more Striæ. They are not all of an equal size, and many of them are forked at their extremities.

The Corpus Ciliare, formed of the Ciliary Striæ and Ciliary Processes, has no appearance of Muscularity, though the contrary has been supposed by some Authors. A fine Injection shews it to be chiefly composed of a continuance of the Blood-vessels of the Choroid Coat, the Branches of which divide into such minute parts, as to give the whole a Villous appearance.

The Corpus Ciliare is glued to the Retina, at the fore part of the Vitreous Humour, and a little behind the edge of the Crystalline Lens; but the Ciliary Processes float in the Aqueous Humour in the Posterior Chamber of the Eye, at the inner side of the root of the Iris, and may be readily turned back behind the edge of the Lens, to which they are contiguous, but do not adhere, of course cannot be supposed to compress it, though this has been the opinion of some Writers.

The Choroid Coat, with its dark paint, serves to absorb the rays of light which pass through the Retina, thereby allowing a distinct image to be formed upon the bottom of the Eye, and preventing the rays from being reflected so as to form a second image.

In those Animals in which this Coat, or its paint, is of a bright colour, it acts as a mirror to reflect light, and make the impression stronger.

OPTIC NERVE AND RETINA.

The *Optic Nerve*, in its passage through the Orbit, is covered by a continuation of the Membranes which surround the Brain.

At the Foramen Opticum, the *Dura Mater* is divided into *two Laminæ*, one of which assists in forming the Periosteum of the Orbit; the other, which is again divided into two Laminæ, furnishes a Sheath to the Nerve, andaccompanies it to the Tunica Sclerotica, to which it is so firmly connected by Cellular Substance, as to have induced some Authors to describe the Sclerotica as a continuation of the Dura Mater.

The Body of the Nerve is still more closely invested by the *Pia Mater*, which also forms Sheaths round the Nervous Fasciculi, and accompanies the Nerve into the Eye.

At the back part of the Ball of the Eye, and a little removed from the Axis, towards the Nose, the *Fasciculi* of the Optic Nerve pass through a Cribriform part of the Sclerotic and Choroid Coats.

The Nerve is contracted at its entrance through the Sclerotic Coat; but immediately after its ingress, it expands to form the Retina,—so called from its supposed Reticular appearance.

In the centre of the Optic Nerve, where it enters the Eye, the *Artery of the Retina* is seen dividing into Branches, which are dispersed upon its inner Surface.

The Retina advances between the Choroid Coat and Capsule of the Vitreous Humour, to the fore part of the Eye, and terminates or disappears upon the anterior part of the edge, or greatest diameter of the Capsule of the Crystalline Lens.

The Retina is contiguous to the Choroid Coat and Capsule of the Vitreous Humour, but does not, by Blood-vessels or otherwise, adhere to either, till it reaches the Corpus Ciliare.

Under the Corpus Ciliare, the Retina is so covered externally by the Pigmentum Nigrum, and adheres internally so closely to the Capsule of the Vitreous Humour, as to be prevented from being seen till the black Paint is washed off, or till all the Coats be removed posteriorly, and the Eye viewed through the medium of the Vitreous Humour.

In the back part of the Retina, and on the side next the Choroid Coat, directly in the Axis of the Eye, there is a transparent Spot, which appears like a Foramen, surrounded by a yellow Border, that becomes paler towards the Circumference. This was first discovered by SOEMMERRING, and is termed *Foramen Centrale;* but its nature is not yet understood. It is said to be peculiar to the Human Species and Ape. According to BLUMENBACH, it may serve as a kind of Pupil through which concentric rays may pass, and be absorbed by the Pigmentum Nigrum of the Choroides, in those Animals which have the Axes of the Eyes parallel to each other, and thereby see objects with both Eyes at once, but are in danger from this of being dazzled by strong light.

The Retina is composed of a tender and Pulpy-like Substance, is semi-transparent, and of a light grey colour, resembling that of ground glass, but becoming a little firmer and more opake when immersed in Spirit of Wine.

From the entrance of the Optic Nerve to the edge of the Corpus Ciliare, the Retina is uniform in its Substance, and is so easily torn and separated from the edge of that Body, as to be described by many Authors as terminating there.

Under the Striæ and Processes of the Corpus Ciliare, the Retina is thinner than in the posterior part of the Eye, and is so compressed by these Bodies, as also to have the appearance of Striæ terminating in numerous minute Fibres, like Nerves in other parts.

The Retina is one of the most sensible parts of the Body. It is the seat of Vision, and therefore the primary part of the Eye, to which all the others within the Orbit are subservient; but that portion which lies over the entrance of the Optic Nerve into the Ball of the Eye is insensible to light, and consequently does not contribute to Vision.

HUMOURS.

AQUEOUS HUMOUR.

The *Aqueous Humour* is lodged in the space between the Cornea and Crystalline Lens.

This space is divided into two Cavities, called *Chambers;* the anterior of which, by far the largest, is situated between the Cornea and Iris.

The posterior is placed between the Iris and Crystalline Lens, and is so much smaller than the former, that its existence has been denied by some Authors, though it is a distinct Cavity, demonstrable, not only in an Adult, where the Pupil is open, but in a Fœtus before the Pupil is formed.

The Aqueous Humour is as clear as the purest water, but is somewhat heavier, possesses a small degree of viscidity, is about five grains in weight, and is found to be composed of water, albumen, gelatin, and muriate of soda.

In a Fœtus, and for the first month after Birth, it is reddish and turbid.

When evacuated, it is quickly renewed; for, within forty-eight hours after it has been discharged by puncture, the Cornea is observed to be again perfectly distended.

It is supposed to be secreted from the neighbouring Arteries, particularly from those on the fore part of the Iris and Ciliary Processes.

It serves to keep the Cornea distended, and, by its roundish form and pellucidity, it assists in collecting and transmitting the rays of light to the inner parts of the Eye. It likewise guards the Iris and Lens, and admits of the motion of the former.

CRYSTALLINE LENS.

The *Crystalline Lens*, which has its name from its resemblance to Crystal, and from its Lenticular form, —though a solid Body, which may be moulded into various shapes,—has always been classed among the Humours of the Eye.

It is situated behind the Aqueous Humour, opposite to the Pupil, and the whole of its posterior portion is received into a Depression on the fore part of the Vitreous Humour.

Like a common Lens, or magnifying Glass, it has two convex surfaces, but the anterior is in general less convex than the posterior; the two being formed of segments of Spheres of unequal size.

The anterior surface, according to the experiments of PETIT, forms the segment of a sphere, the diameter of which is between seven and eight lines, or twelfths of an inch; while the posterior Surface is only equal to the segment of a sphere of about five lines in diameter.

It has been observed by ZINN,—that the figure of the Lens varies at different periods, being in a Fœtus almost of a spherical form, but becoming gradually flatter on the anterior and posterior Surfaces, till about the age of thirty, after which its form does not appear to vary.

As the figure, so also the colour and consistency, are found to change at different times of life.—In a Fœtus, not only a Capsule, which covers it, but the Lens also, is of a reddish colour; but immediately after Birth they become perfectly transparent.—In a person considerably advanced in years, the Lens is observed to acquire a yellow tinge, which appears first in the centre, and afterwards extends gradually to the circumference; and in extreme old age, this yellow tinge becomes so deep as to resemble Amber.

An Aqueous Fluid is described as being situated between the Crystalline Lamellæ, which is supposed to decrease in quantity, and to become somewhat yellow, the Lens at the same time increasing in solidity as the Person advances in life.—This difference, however, of convexity, colour, and consistence, according to the difference of age, is not met with uniformly.

The Lens becomes opake, soon after death, and acquires an additional opacity when put into Spirit of Wine.

It is composed of concentric Lamellæ, laid over each other like the coats of an Onion. These Lamellæ are connected by fine Cellular Substance, and are more closely compacted the nearer they are to the centre.

This Lamellated Structure may be readily observed in the Eye of an Ox, or any other large Animal, but is most evident when the Lens has been boiled in water, or macerated in water or vinegar.

When the maceration is continued for some time, the Lamellæ put on a radiated appearance, the Radii running in a vertical manner, or issuing from the centre to the circumference, dividing the Surface into Isosceles Triangles, or like the Meridian lines running between the two Poles of a Geographical Globe.

The Lamellæ were discovered by LEUWENHOECK to be of a Fibrous structure. By some Authors these Fibres have been considered as Muscular, and capable of varying the convexity of the Lens according to the distance of the objects we look at; but it is observed, that the Eyes from which the Lens has been removed, are, by the assistance of Glasses, enabled to form distinct Vision.

The Substance of the Lens somewhat resembles half-melted Gum, is very soft and tender on the outside, but becomes gradually firmer and tougher towards the centre, where it forms a Nucleus, in consequence of which its refractive power is found to be more equal than any Lens produced by art.

The Lens is surrounded by a very pellucid proper Capsule, called *Tunica Aranea*, vel *Crystallina*, which is much thicker and more elastic than the Capsule of the Vitreous Humour, but adheres so slightly to it, and is so easily lacerated, that after a small puncture is made in it, the Lens starts out, upon applying gentle pressure to the Capsule.

The posterior part of the Capsule is much thinner, softer, and weaker, than the anterior; but is quite a *distinct Membrane* from the Coat of the Vitreous Humour, to which it is contiguous; yet so firmly connected to it by Cellular Substance, that it is difficult to separate them without laceration.

Some Authors describe an *Aqueous Humour* as seated between the Lens and its Capsule; while others deny the existence of this Humour, as well as of that which is said to be situated between the Lamellæ of the Lens.

The *Vessels* of the Lens, or of its Capsule, are not to be seen in the Eye of an Adult; but in that of a Fœtus, PETIT found Vessels passing from the Corpus Ciliare over the fore part of the Capsule of the Lens.

WINSLOW afterwards observed, that in a Fœtus, and in new born Children, a fine Injection succeeded so well, as to discover the Vessels of the Membranæ Crystallina et Vitrea;—and in a Fœtus of about six months, the injected liquor seemed to him to have penetrated a part of the Crystalline and Vitreous Humours.

ALBINUS derives these Vessels from a double source.—In the Eye of a Whale, he demonstrated Vessels passing from the Ciliary Processes to the Substance of the Lens; and, at a later period, he injected in the Human Eye a small Branch arising from the Central Artery of the Retina, which proceeded in a straight direction through the Vitreous Humour, and divided on the posterior part of the Capsule into Numerous Branches, many Twigs of which plunged into the substance of the Lens.

This Artery and its Branches, have been frequently and successfully injected by succeeding Anatomists.

Vitreous Humour.

The *Vitreous Humour* is situated in the back part of the Cavity of the Eye, which it occupies from the insertion of the Optic Nerve to the Surface of the Crystalline Lens.

It is round at the back part and sides, where it is covered by the Retina; but is concave before, where it forms a bed for the Lens.

It is by much the largest of the three Humours, occupying upwards of nine-tenths of the whole Eye, and has a Gelatinous appearance,—or somewhat like the Glaire of an Egg.

In an Adult, it is always very transparent; and in an Old Person, it does not, like the Lens, degenerate into a yellow, or any other colour.

In a Fœtus, like the Aqueous Humour, it is of a reddish tint.

The liquor of which the Vitreous Humour is composed, is similar to the Aqueous,—very fluid, transpires readily through the Capsule, though that Coat be entire, and, like the Aqueous Humour, is somewhat thicker, heavier, and more viscid than Water.

When this Humour is evacuated by puncture, in the living Body, it is very seldom, though sometimes, renewed.

Upon the Surface of this Humour there is a Coat, termed *Vitrea*, vel *Hyaloidea*, from its resemblance to Glass, as transparent as the Humour itself, and so thin and Cobweb-like, as to have also the name of *Aranea*.

The *Tunica Vitrea* is remarkably smooth on its outer

Surface; excepting at its fore part, where it is impressed by the Corpus Ciliare and Pigmentum Nigrum; but within, it sends Processes into the Body of the Humour, of the same nature with the external Membrane.

Some Authors, and among these WINSLOW, have described this Coat as consisting of two Laminæ; but SABATIER, and other late Writers, seem sufficiently satisfied that it is a single Layer; and even this single Layer cannot be raised but with difficulty, though it is demonstrable by making a puncture to allow the Humour to escape, and by afterwards distending the part with air.

The structure of the Humour consists of a set of delicate Cells, which contain the Liquor within them, as may be seen by the assistance of Acids, or by boiling Water, or by Congelation.

The Cells of the Humour communicate freely with each other, as appears from the Liquor oozing out by the smallest puncture made in the general Capsule.

Under the Corpus Ciliare, the Capsule of the Vitreous Humour sends off an external Lamina, which accompanies the Retina, and is inserted with it into the fore part of the Capsule of the Lens, a little before its anterior edge. It is termed *Membranula Coronæ Ciliaris*, vel *Zonula Ciliaris*, from its striated appearance, and circular form. This Membrane, though extremely thin, assists in fixing the Lens to the Vitreous Humour.

After sending off the Ciliary Zone, the Coat of the Vitreous Humour goes behind the Capsule of the Lens, with which it is intimately connected.

Between the Ciliary Zone and part where the Capsule of the Vitreous Humour adheres to that of the

Lens,—which is at the same distance behind the edge of the Lens with the distance of the insertion of the Ciliary Zone before it,—a passage is formed, named *Canalis* PETITIANUS, after PETIT, who discovered it.

The Membranes forming this passage are pervaded by transverse Fibres, in such a manner, that when Air is introduced, it goes freely round the edge of the Lens; but the Passage has a Cellular appearance, being contracted and dilated alternately.

The Canal of PETIT is nearly of the same breadth with the Corpus Ciliare, is always empty, and has no communication with the Capsules of the Vitreous or Crystalline Humours.

No Vessels are to be seen in the Vitreous Humour of an Adult; but in the Eye of a Fœtus, an Artery is observed to arise from the Central one of the Retina, which passes through the middle of the Vitreous Humour, sending Twigs to the Cellular Texture of this Humour, while the principal Trunk is continued to the Capsule of the Crystalline Lens, as has been already observed.

The Vitreous Humour serves to give shape to the Eye, to keep the Coats properly expanded, to preserve the due distance of the Lens from the Bottom of the Eye, and direct the rays of light to the Retina.

MUSCLES OF THE BALL OF THE EYE.

The Ball of the Eye is moved by *six Muscles*, which are divided, on account of their direction, into *four straight* and *two oblique*, obtaining their respective names from their size, situation, direction, or use.

Of the Straight Muscles, one is situated above the Eye, another below it, and one on each side. Of the Oblique, one is placed in the upper and inner, and the other at the under and outer part of the Eye.

The *Recti* are not straight, as the name implies; for, on account of the form of the Eye, all, except the internal, or that next the Nose, have somewhat of a curved direction.

Neither are they all equally long, the internal being the shortest, the external the longest, corresponding with the shape of the Eye and Orbit. The other two are nearly of the same length with each other.

The four Straight Muscles, which bear a strong resemblance to one another, arise by a narrow beginning a little Tendinous and Fleshy, from the edge of the Foramen Opticum, where they embrace the Optic Nerve at its entrance in the Orbit.

In their passage forwards, they form Fleshy Bellies, which send off broad and very thin Tendons, to be inserted into the Sclerotic Coat, under the Tunica Adnata, about a quarter of an inch behind the edge of the Cornea, and at equal distances from each other.

At the place of their Insertion, they are so intimately connected with the Sclerotica, that they cannot be separated from it, or their Insertion be brought as far as the Cornea, without evident laceration.

Of the Oblique Muscles, one arises along with the Recti, the other comes from the fore part of the Orbit, and both are fixed to the back part of the Sclerotica.

The different Muscles of the Eye, where they lie upon the Ball, are covered with a Cellular Sheath, which afterwards degenerates into that Cellular Substance which is interposed between the Sclerotica and Conjunctiva.

The Recti Muscles move the Eye according to their respective situations. When two of the opposite Recti act, or all of them act together, they draw the Eye into the Orbit.

When two of the adjacent Recti act, they turn the fore part of the Eye obliquely in a direction towards their origins.

The Oblique Muscles, acting separately, roll the Eye according to their situation and the direction of their Fibres; moving conjunctly, they draw the Eye forward, and become the antagonists of the Recti.

LEVATOR OCULI,

Vel *Rectus Attollens*, vel *Superbus*.

Origin: From the upper part of the Foramen Opticum below the Levator Palpebræ Superioris, under which it passes to the Eye.

Insertion: Into the upper and fore part of the Tunica Sclerotica.

Action: To raise the fore part of the Ball of the Eye.

DEPRESSOR OCULI,

Vel *Rectus Deprimens*, vel *Humilis*.

Origin: From the inferior part of the Foramen Opticum. It lies at the bottom of the Orbit.

Insertion: Opposite to the former.

Action: To pull the fore part of the Eye downwards.

ADDUCTOR OCULI,

Vel *Rectus Adducens*, vel *Bibitorius*.

Origin: From the Foramen Opticum, between the Obliquus Superior and Depressor; and running at the inner side of the Orbit, it has its

Insertion opposite to the inner Angle of the Eye.

Action: To turn the fore part of the Eye towards the Nose, as in drinking.

ABDUCTOR OCULI,

Vel *Rectus Abducens*, vel *Indignabundus*.

Origin: From the Bony Partition between the Foramen Opticum and Lacerum. It passes at the outer part of the Orbit, to have its

Insertion into the Ball of the Eye, opposite to the outer Angle.

Action: To turn the fore part of the Eye towards the Temple.

OBLIQUUS SUPERIOR,

Vel *Obliquus Major*, vel *Trochlearis*.

Origin: Like the straight Muscles, from the edge of the Foramen Opticum, between the Levator and Adductor Oculi. From thence it runs directly forwards, sends off a long round Tendon, which passes through a Cartilaginous Pulley fixed behind the Internal Angular Process of the Os Frontis, and is here inclosed in a Bursa Mucosa. From this it goes a little downwards, and is then reflected backwards and somewhat outwards, passing under the Levator Oculi.

Insertion: By a broad thin Tendon, into the Tunica Sclerotica, about half-way between the Insertion of the Levator Oculi, and entrance of the Optic Nerve.

Action: To roll the Ball of the Eye, by turning the Pupil downwards and outwards.

OBLIQUUS INFERIOR,

Vel *Obliquus Minor.*

Origin: By a narrow beginning, from the anterior edge of the Orbitar Process of the Superior Maxillary Bone, near the Lacrymal Groove, from which it passes obliquely outwards, backwards, and upwards, round the Ball of the Eye.

Insertion: By a broad thin Tendon, into the Sclerotic Coat, between the entrance of the Optic Nerve and insertion of the Abductor Oculi, and opposite to the insertion of the Obliquus Superior.

Action: To roll the Ball of the Eye, by turning the Pupil upwards and inwards, and, with the assistance of the Obliquus Superior, to pull the Eye forwards. By some the two Oblique Muscles have been considered, in consequence of their situation, so to constrict the back part of the Eye, as to lengthen its Axis there, and thereby increase the distance between the Lens and bottom of the Retina.

The two Oblique Muscles, on account of rolling the

Eye, and assisting it in the expression of certain Passions, have been called *Rotatores*, and *Amatores*.

VESSELS OF THE EYE.

The *Frontal*, *Facial*, and *Temporal Arteries*, which are branches of the External and Internal Carotids, supply the Palpebræ, and communicate with those which are dispersed within the Orbit.

Some small Branches of the *Internal Maxillary Artery* pass through the Inferior Orbitar Fissure, to be dispersed chiefly upon the Periosteum of the Orbit and Fat of the Eye.

The *Ocular Artery*, which is a Branch of the Internal Carotid, passes through the Foramen Opticum in company with the Optic Nerve, and supplies the Fat, Muscles, and Ball of the Eye, and also the Lacrymal Gland and Tunica Conjunctiva.

The Branches which belong to the Ball of the Eye, have the name of *Ciliares*. They perforate the Sclerotica in different places, and are afterwards dispersed upon the Choroid Coat and Iris.

One Branch of the Ocular Artery, called *Centralis Retinæ*, perforates the Optic Nerve, and is dispersed upon the Retina.

The *Veins* which correspond with the Arteries of the Eye, communicate freely with each other, and pass partly to the External Jugular Vein, by Branches situated about the fore part of the Orbit, and partly to the internal Jugular Vein, by the Cavernous Sinus.

NERVES OF THE EYE.

Besides the *Optic Nerve*, already taken notice of, the Eye receives the Third and Fourth Nerves, and Branches from the first portion of the Fifth, together with the Sixth, and Branches from the Seventh.

The parts about the Fore side of the Orbit are supplied by Branches from the Fifth and Seventh Nerves;—the Ball of the Eye by Nerves called *Ciliary*, which come from the Third and Fifth;—the Fat, Muscles, Lacrymal Gland, &c. are supplied by the Third, Fourth, Fifth, and Sixth Nerves.

OF VISION.

The Humours of the Eye, and especially the Crystalline Lens, receive and collect the Rays of light, in such a manner as to form upon the Retina the image or picture of the object which the Eye looks at; and the point where the different rays meet is called the *Focus*.

The object is painted upon the Retina in an *inverted* manner, the rays from above being reflected to its under, and those from below to its upper part; while the rays from the right side of the object are sent to the left, and those from the left to the right side of the Eye. The rays which go through the centre of the Cornea pass in a perpendicular direction to the bottom of the Eye; and it is supposed to be by habit, or rather by instinct, that we judge of the *real* situation of any object.

That the rays of light may terminate distinctly on the Retina, it is necessary that both the Cornea and Crystalline Lens should have a certain degree of convexity.

If either the one or the other be too prominent, the Focus will be formed before it reach the Retina, as is the case in short-sighted people, who require concave glasses to enable them to see objects distinctly, at the proper and ordinary distance.

If, on the contrary, the Cornea or Lens be too flat, or the refractive power of the Humours be in any way diminished, the Focus will then fall behind the Retina, and be imperfectly formed, till the object is viewed at a greater distance than ordinary, as is the case with persons advanced in life, to whom the assistance of convex glasses becomes necessary.

How an object, viewed with both Eyes, appears single, has been, as well as our judging of the real situation of any object, ascribed by the generality of Authors to custom and habit; and by others to instinct, which regulates the uniform motion of the Eyes, and the accurate application of both to one point.

The Eye is enabled to judge of, or accommodate itself to, objects at different distances, by the action of its Muscles increasing or diminishing the length of its Axis, and by the motions of the Iris allowing a greater or smaller quantity of light to be thrown into the Eye.

TAB XXI

Fig. 1.

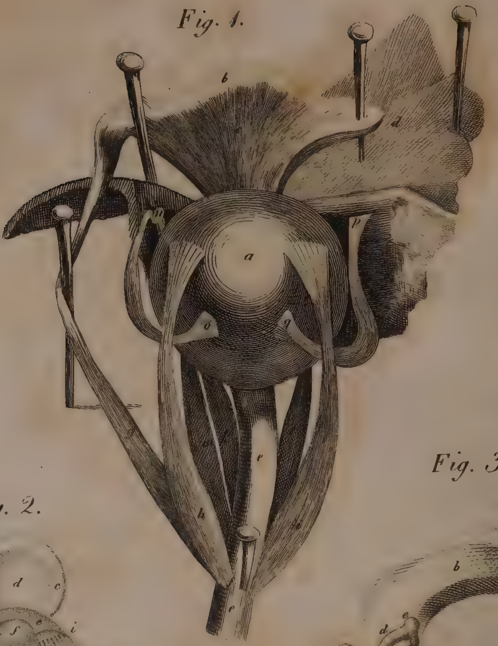


Fig. 2.

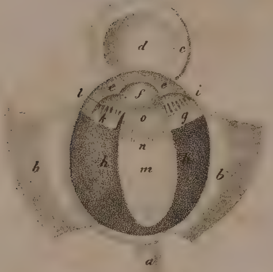


Fig. 3.

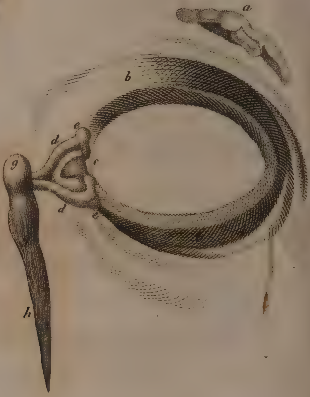


Fig. 4.

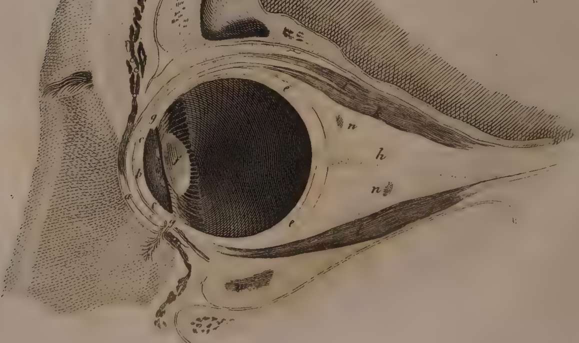


TABLE XXI.

VIEWS of the EYE and its Appendages.

FIG 1.

Represents the RIGHT EYE, *with its* MUSCLES, *viewed obliquely from its Upper and Outer Side.*

a, The eye-ball.

b, Part of the upper eye-lid.

c, The tunica adnata, adhering to the edge of the cornea.

d, The integuments of the right side of the nose.

e, *e*, The optic nerve.

f, The four straight muscles, with the levator palpebræ superioris, and obliquus superior, embracing the optic nerve where it enters the orbit.

g, The levator palpebræ superioris drawn aside.

h, The levator oculi.

i, The abductor oculi.

k, The adductor oculi.

l, The depressor oculi.

m, The obliquus superior, vel trochlearis.

n, The trochlea of the obliquus superior.

o, The insertion of the tendon of the obliquus superior in the eye-ball.

p, The obliquus inferior taking its rise from the superior maxillary bone.

q, The insertion of the tendon of the obliquus inferior in the eye-ball.

OF THE EAR.

THE EAR, or Organ of Hearing, is divided into *External* and *Internal Ear*.

EXTERNAL EAR.

The *External Ear* comprehends the *Auricle*, or *Ear* properly so called, and the *Meatus Auditorius Externus*.

It is again divided into *Pinna* or *Ala*, which constitutes by much the greater part of it, and *Lobus*, which is placed at its under end.

The *Pinna* is chiefly composed of Cartilage, and is divided, at its fore part, into several *Eminences* and *Cavities*, which have received particular names; viz.

The *Helix*, or outer Bar or Margin, which arises behind, at the Lobe of the Ear, surrounds its upper edge, and terminates below, nearly opposite to its origin; dividing the Concha into two parts.

The *Antihelix*, *Anthelix*, or inner Bar or Margin, which is situated within the former, and is composed superiorly of two Ridges, uniting together below.

The *Tragus*, which is a small Eminence, lying over the Meatus Externus, and is connected to the under and fore part of the Helix.

The *Antitragus*, placed opposite to the Tragus, and below the posterior extremity of the Antihelix.

The *Cavitas Innominata*, situated between the Helix and Antihelix.

The *Scapha*, or *Fossa Navicularis*, situated between the two limbs of the Antihelix.

The *Concha*, which is a large Cavity under the Antihelix; divided by the Helix into two parts, the inferior of which leads to the Meatus Auditorius.

The back part of the External Ear exhibits only one considerable *Eminence*, which is the convex Surface of the Concha.

The *Lobus*, which is the inferior soft part of the Ear, is composed of Cellular Substance, with a small quantity of Fat.

The Ear is covered by a continuation of the common Integuments, which are thinner here than on the rest of the Body, and are perforated in many parts by the Mouths of Sebaceous Ducts, placed immediately under the Skin.

The motions of the Ear, which are very limited, are regulated by several *Muscles*, some of which are common to the Ear and Head, and others proper to the Ear itself. The former have been already described. The latter lie close upon the Cartilage, and, in the generality of Subjects, are so thin, white, and indistinct, as to receive from some Authors the name of *Muscular Membranes.*—They are considered as being calculated to give a degree of tension to the Ear, and are as follow:

HELICIS MAJOR.

Origin: From the anterior acute part of the Helix, upon which it ascends.

Insertion: Into the Helix.

Action: To pull that part into which it is inserted a little downwards and forwards.

HELICIS MINOR.

Origin: From the under and fore part of the Helix.

Insertion: Into the Helix, near the Fissure in the Cartilage opposite the Concha.

Action: To contract the Fissure.

TRAGICUS.

Origin: From the middle and outer part of the Concha, at the root of the Tragus, along which it runs.

Insertion: Into the point of the Tragus.

Action: To pull the point of the Tragus a little forwards.

ANTITRAGICUS.

Origin: From the internal part of the Antitragus, upon which it ascends.

Insertion: Into the tip of the Antitragus, as far as the inferior part of the Antihelix, where there is a Fissure in the Cartilage.

Action: To turn the tip of the Antitragus a little outwards, and depress the extremity of the Antihelix.

Transversus Auris, vel *Transversus Auriculæ.*

Origin: From the prominent part of the Concha, on the back of the Ear.

Insertion: Into the outside of the Antihelix.

Action: To draw the parts to which it is connected towards each other, and to stretch the Scapha and Concha.

The *Cartilage* of the External Ear is connected to the Temporal Bone by the common Integuments, and by its Muscles; and is furnished with Ligamentous Membranes, which fix it to the roots of the Zygoma and Mastoid Process.

The Auricle collects sound, and conveys it to the Meatus Externus,—the Muscles giving tension to it, so as to render the sound more distinct.

The *Meatus Auditorius Externus* leads inwards from the Concha, and in its course proceeds somewhat forwards and upwards, turning a little downwards at its farthest extremity, and terminating at the Membrana Tympani. The turns, however, are so inconsiderable, that the bottom of the passage may be readily seen in a clear light, on pulling the Ear backwards.

It is rather of an *oval* form, a little contracted in the middle, and from an inch to an inch and a half in length.

Its outer end, which is a continuation of the Concha, is Cartilaginous, and has two or three *Interruptions* or *Fissures* in it.

On the upper and back part of its circumference, there is a *Large Interruption* terminating in an oblique Margin, which is fixed to the rough edge of the under part of the Osseous Portion of the Meatus.

At the superior and posterior part of the Meatus, the Cartilage has but little connexion with the Bone, being there fixed by the Skin which lines the Canal.

The Osseous is continued from the Cartilaginous part of the Canal, and is the longer of the two, particularly at its upper and back part.

The Meatus is *lined* with a continuation of the Skin, which fills up the Interruption in the Cartilage, but, like the Skin covering the Auricle, it is thinner than on the rest of the Body.

Between the inner lining and Cartilage of the outer half of the Meatus, there are numerous small Glands, of a yellowish colour, placed in a Reticular Substance formed by the Corpus Mucosum, and termed *Glandulæ Ceruminosæ*. These discharge the Wax of the Ear through small Excretory Ducts.

The wax lubricates the Passage, and defends it from injury, and, being of a viscid and bitter quality, assists in the exclusion of insects.

The *Arteries* of the External Ear come anteriorly from the Temporal, and posteriorly from the Occipital; both of which are Branches of the Externla Carotid Artery.

The *Veins* pass partly to the External, and partly to the Internal Jugulars.

The *Nerves* which supply the fore part of the Ear, are derived from the third part of the Fifth, and from the Portio Dura of the Seventh Pairs. Those which supply the under and back part come from the first and second Cervicals.

The Meatus Externus conveys sound from the outer towards the inner Ear, and is supposed to do this to greater advantage on account of the winding nature of the Passage.

In a Fœtus, the Meatus is entirely Cartilaginous, and only adheres to an imperfect Bony Circle, in which the Membrana Tympani is fixed.

At the inner end of the Meatus Externus, the *Membrana Tympani* is situated, which is thin but firm, somewhat dry and elastic, almost transparent, and of an oval form; the longest diameter of the oval being about four tenths of an inch in length.

It is fixed in a *Groove* which divides the Meatus from the Tympanum.

It is very tense, but has a small *Depression* in the middle, next the Meatus, with a corresponding *Convexity* towards the Tympanum, where the extremity of the Bone called Malleus is fixed.

Its situation is somewhat oblique, the upper part being turned outwards, and the under inwards, so that the lower side of the Meatus is a little longer than the upper.

It forms a complete impervious *Septum*, though the contrary has been maintained by some Authors.

It is formed partly of a continuation of the lining of the Meatus, but chiefly of the Periosteum.

The Membrana Tympani has numerous small *Vessels*, from the Temporal and Stylo-mastoid Arteries, which run in a radiated manner, and which are most abundant in a Fœtus. The course of the Vessels in it may be the cause of its having been lately described as a Muscle with radiated Fibres.

This Membrane serves, by its form and tension, to collect the vibrations of sound, and to conduct them from the outer to the inner Ear.

In a Fœtus, the Membrana Tympani is fixed in an imperfect ring of Bone, being open above, and, along with the Meatus, it is covered with a Mucous Substance, which defends the parts from the too strong impulse of Sound. The Mucous Membrane sloughs off by degrees after birth.

INTERNAL EAR

The *Internal Ear* comprehends the *Tympanum*, *Labyrinth*, and certain *Passages* leading into these.

The *Tympanum* is situated at the inner side of the Membrana Tympani, approaches to a hemispherical figure, and is about half an inch in width.

Between the Tympanum and Cavity called Labyrinth, there is an *Osseous Septum*, which forms the bottom of the Tympanum, where there are *several Eminences*, viz.

The *Promontory*, which forms the beginning of the

Scala Tympani, and divides the Tympanum into anterior and posterior Regions.

A *Protuberance* at the upper and back part of the Tympanum, formed by the Aquæductus FALLOPII.

A *Projection* called *Eminentia Pyramidalis Tympani*, situated behind the Fenestra Ovalis, in which is the Passage for the Stapedius.

An *Eminence* at the upper and fore part of the Tympanum, containing a semi-canal, for lodging part of the Tensor Tympani.

In the Tympanum there are various *Passages*, which communicate with the neighbouring parts, viz.

The *Iter a Palato ad Aurem*, or EUSTACHIAN *Tube*, so named from the describer, though known to ARISTOTLE, which goes off from the upper and fore part of the Tympanum, and, running obliquely forwards and inwards to the posterior Opening of the Nostril, terminates at the outer edge of that opening, above the Arch of the Palate, the whole Tube being about an inch and a half in length.

The posterior part of the Tube is Osseous, being formed in the Pars Petrosa, at the upper and outer part of the Canal for the Carotid Artery.

The anterior portion is formed above, by the Spinous Process, and root of the Pterygoid Process of the Sphenoid Bone;—and below, by Cartilage and Membrane.

It is narrow next the Ear, where it can admit only the point of a Surgeon's Probe, but becomes gradually wider towards the Nose, where it terminates by an oblique opening with prominent sides, sufficiently large to admit the end of a Goose-quill.

It is lined by a Membrane similar to that of the Nose, of which it appears to be a continuation; and which, on the edge of the Mouth of the Tube, is so thick as to add considerably to its prominency.

The EUSTACHIAN Tube preserves the balance of Air between the outer and inner Ear, and prevents it from pressing too forcibly upon the different Membranes placed in the sides of the Tympanum.

It has been supposed to convey the sound of a Person's own Voice to the inner Ear; but Experiment does not favour this opinion, nor is it found to render Sound more distinct when the Mouth is open;—though Persons who have a degree of deafness are observed frequently to listen after this manner.

The *Cells of the Mastoid Process*, which open into the upper and back part of the Tympanum opposite to, but a little higher than, the EUSTACHIAN Tube.

They contain Air, and are very irregular, varying in number and size in different Persons, having many windings and turnings, which communicate with each other, and are lined, like the Cells of other Bones, by the Periosteum Internum. Sometimes, instead of Cells, the Mastoid Process contains one large Cavity, which communicates with the Tympanum in the common way.

They assist the Tympanum in reflecting Sound, in increasing its strength, and conveying it to the Labyrinth.

In many of the Digitated Mammiferous Quadrupeds, there are large *Cavities*, connected with the Tympanum, which seem to supply the place of Mastoid Cells.

Above the Promontory, a *Hole* called *Fenestra Ovalis*, the upper and under edges of which are convex upwards,–for lodging the Base of the Bone called Stapes. The long diameter of this Fenestra is placed transversely, and is nearly double the length of the short one.

The inner edges of this Hole are contracted by a narrow Border, upon which the end of the Stapes rests.

Below the Fenestra Ovalis, and at the under and back part of the Promontory, a *Hole*, smaller than the former, called *Fenestra Rotunda.*

It is placed obliquely backwards and outwards, and leads to the Cochlea, but is shut in the Subject by a thin Substance, termed *Membrana Tympani Secundaria*, stretched across the inner side of it, which assists in communicating Sound to the Labyrinth. The two Foramina are placed opposite to the Membrana Tympani.

The *Sides* or *Walls* of the Tympanum, which likewise assist in conveying Sound to the Labyrinth, are lined with Periosteum, which is reflected into the different Passages leading from it.

The Cavity of the Tympanum contains air, and four small Bones called *Ossicula Auditus*, which form a Chain, stretching irregularly from the Membrana Tympani to the Labyrinth.

The *Ossicula Auditus* are,—the *Malleus*, the *Incus*, the *Os Orbiculare*, and the *Stapes*,—these names being derived from Substances which the Ossicula are supposed to resemble in shape.

The *Malleus*, or *Hammer*, consists of a round Head, a small Neck, a Manubrium or Handle, and two small Processes; one in the Neck, long and very slender, and therefore called *Gracilis*; the other in the upper end of the Handle, called *Processus Brevis.*

The Handle is by some Authors considered as one of the Processes, and is then called the longest of the three. It forms an angle with the Neck, is slightly compressed, becomes gradually smaller, and is bent at its extremity towards the Membrana Tympani.

In the natural situation, the *Head* of the Malleus is turned upwards and inwards, and the *Handle* down upon the Membrana Tympani, to which it adheres.

The *Incus*, compared in shape to an *Anvil*, but more resembling one of the Dentes Molares with its roots widely separated, is situated behind the Malleus, and is formed of a *Body* and *two Crura*, one of which is termed the Short or Superior, and the other the Long or Inferior Crus.

The *Body* has a *Cavity* and *two Eminences*, corresponding to the back part of the head of the Malleus, with which it is articulated.

The *short Crus* extends backwards, and is joined by a Ligament to the edge of the Mastoid Opening.

The *long Crus*, which is smaller than the other, is turned downwards, with the point a little flattened, and bent inwards.

The *Os Orbiculare*, vel *Lenticulare*, is the smallest Bone of the Body, being considerably less than a grain of Mustard-seed.

It is articulated with the point of the Long Process of the Incus, and is so firmly fixed to it, that it has been frequently considered as a Process of that Bone.

The *Stapes* is named from a striking resemblance it has to a *Stirrup*. It is divided into *Head*, *Crura*, and *Base*.

The *Head* is placed upon a small flat Neck, and is articulated with the Os Orbiculare.

The *Crura*, like those of the Incus, are unequal in length, and have each a Groove on the inside, which gives insertion to the Membrane stretched between them.

The *Base* is of an oval or rather semi-oval shape, and has no Perforation in it; its edges correspond with those of the Fenestra Ovalis, with which it is articulated.

The Stapes is placed horizontally, being nearly at a right angle with the inferior Crus of the Incus. Its two Crura are placed in the same plane,—the longest backwards.

The small Bones of the Ear are *articulated* with each other by *Capsular Ligaments* proportioned to their size, and are covered by Periosteum, which likewise fixes them to the Membrana Tympani, and Fenestra Ovalis.

The small Bones have the following *Muscles* fixed to them, which serve for their different motions.

TENSOR TYMPANI, vel *Internus Mallei.*

Origin: From the Cartilaginous Extremity of the EUSTACHIAN Tube, near the entry of the Artery of the Dura Mater. From thence its Fleshy Belly runs backwards, in a Canal peculiar to it, at the upper and inner parts of the Osseous Portion of the Tube, being covered only by a thin Plate of Bone. It sends off a slender Tendon, which makes a turn in the Tympanum, and passes outwards.

Insertion: Into the inner and back part of the Handle of the Malleus, a little below the root of its long Process.

Action: To pull the Malleus and Membrana Tympani inwards, by which the Membrane is rendered more tense, and more concave towards the Meatus Externus, and thereby better adapted for the impression of weak Sounds.

LAXATOR TYMPANI, vel *Externus Mallei.*

Origin: By a very small beginning, from the extremity of the Spinous Process of the Sphenoid Bone, behind the entry of the Artery of the Dura Mater; after which it runs backwards and a little upwards, along with a Branch of the Seventh Pair of Nerves, called *Chorda Tympani*, at the outside of the EUSTACHIAN Tube, in a Fissure of the Os Temporis, near the Fossa which lodges the Condyle of the Lower Jaw.

Insertion: Into the long Process of the Malleus, which is lodged in a small Canal at the upper part of the Tympanum.

Action: To draw the Malleus obliquely forwards and outwards, and thereby to render the Membrana Tympani less convex, or to relax it when sounds are too strong. This Muscle is so small and tender, that its nature is known with difficulty. HALLER denies the existence of Muscular Fibres in it.—SABATIER describes it, but doubts its Muscularity.

The *Laxator Tympani* of ALBINUS, a minute Substance, arising from that part of the Meatus Auditorius to which the upper edge of the Membrana Tympani is fixed, and inserted into the Superior Extremity of the Handle of the Malleus, is considered by many Anatomists as a Ligament.

STAPEDIUS.

Origin: By a minute Fleshy Belly, from a small Cavern in the Pars Petrosa, near the Cells of the Mastoid Process, before the inferior part of the FALLOPIAN *Aqueduct* or Passage for the Portio Dura. Its Tendon passes forwards through a Perforation in the sides of that Cavern, and goes into the Tympanum.

Insertion: Into the posterior part of the Head of the Stapes.

Action: To draw the Head of the Stapes obliquely upwards and backwards, by which the posterior part of its Base is moved inwards, and the anterior part outwards, and the Membrana Tympani thereby put upon the stretch.

LABYRINTH.

The *Labyrinth*, so called from its Sinuosities and Windings, is situated at the inner part of the Tympanum, and is formed of the *Vestibule*, *Cochlea*, and *Semicircular Canals*, together with the *Canalis* FALLOPII and *Meatus Auditorius Internus.*

The *Vestibule*, named from its forming a Porch or Entry to the Cochlea and Semicircular Canals, is of an oval figure, nearly of the size and shape of a decorticated grain of Barley, and is situated at the inner side of the Base of the Stapes.

There are three contiguous *Cavities* in the Vestibule, one of which, the *Semi-oval*, is situated above; another, the *Hemispherical*, below; and the third, or *Sulciform*, which is the Orifice of the Aquæductus Vestibuli, is placed behind.

In the Vestibule there are several Holes which communicate with the neighbouring parts, viz.

The *Fenestra Ovalis*, situated at the outside, by which it communicates with the Tympanum.

The *Fenestra Rotunda*, situated at the fore and under part, by which it communicates with one of the Canals of the Cochlea.

Five similar Foramina behind, by which it communicates with the Semicircular Canals.

Towards the Meatus Auditorius Internus, it has four or five *Cribriform Perforations*, for the transmission of Nerves.

The *Cochlea* is placed obliquely, next the anterior extremity of the Os Petrosum, and at the fore part of the Vestibule, in such a manner as to have its Base towards the Meatus Auditorius Internus, and its Apex in the opposite direction, or facing outwards.

It has two *Canals* or *Gyri*, called *Scalæ*, from a supposed resemblance to a stair-case; one of which is placed on the outer and fore side, the other on the inner and back part. The Gyri are very close to each other, and run in a spiral direction, like the turns in the shell of a Snail, from which the part has obtained its name.

The Cochlea forms *two Circumvolutions* or *Turns and a half*, the first of which is much larger and wider than the other turn and a half, which become suddenly smaller, the whole approaching to a globular form.

The two Canals are upon the same level, the inner one next the Base, and the outer next the point of the Cochlea.

The *Gyri* go round a Nucleus, Axis, or Central Pillar, which is nearly horizontal, and is formed of *two hollow Cones*, with their points turned to each other, the one termed *Modiolus*, from its resemblance to the Spindle of a winding Stair-case, the other *Infundibulum*, or Funnel.

The *Modiolus* forms the inner and larger portion of the central Pillar, and is that Cavity seen in the bottom or outer extremity of the Meatus Auditorius Internus.

It lodges the Branch of the *Portio Mollis* of the Seventh Pair of Nerves, which goes to the Cochlea, and is Cribriform, or full of small Holes, for the passage of the Twigs of that Branch.

The Modiolus consists of *two Plates*, with numerous *Cells* and *Passages* between them, and terminates in the middle of the second Gyrus of the Cochlea.

The *Infundibulum* is an imperfect Funnel, the Apex of which is common with that of the Modiolus, and the Base is covered by the Apex of the Cochlea, which is termed *Cupola*.

Between the Scalæ of the Cochlea there is a Partition, called *Lamina Spiralis*, or *Septum Scalæ*; the larger portion of which, next the Modiolus, is formed of Bone; the remainder, or that part next the opposite side of the Scalæ, is composed of a Cartilaginous Membrane, and termed by VALSALVA *Zona Cochleæ*.—This drops out by maceration, so as afterwards to leave only a partial Septum.

The Osseous part of the Lamina Spiralis is composed of *two extremely thin Cribriform Plates*, which gradually approach each other at their opposite edges, where they are perforated by numerous Holes.

The termination of the Lamina Spiralis, and of the Scala Tympani, forms a *Hamulus*, or small Hook, which projects into the Infundibulum.

One of the Canals or Scalæ of the Cochlea opens into the under and fore part of the Vestibule, and is termed *Scala Vestibuli;* this is not shut by any Membrane: The other, which is the smaller of the two, communicates with the Tympanum by the Fenestra Rotunda, but is shut in the Subject by the Membrana Tympani Secundaria, and is called *Scala Tympani.*

The partition between the two Gyri or Turns of the Cochlea, like the Osseous part of the Lamina Spiralis, is formed of *two Plates*, with a small *Cavity* between them.

The *Volute*, or Spiral of the Cochlea, begins below, runs forwards, then upwards and round, so as to form, as has been already mentioned, two Circles or Turns and a half, the direction of the Gyri corresponding with those of the Shell of a Snail.

The Canals of the Cochlea are Conical, becoming gradually smaller towards the Apex, where they communicate with each other, through the medium of the Infundibulum. This communication is called by CASSEBOHM, *Canalis Scalarum Communis.*

The *Semicircular Canals* are three in number,—the *Superior* or *Vertical*,—the *Posterior* or *Oblique*,—and the *Exterior* or *Horizontal.*

The *Superior* is placed transversely, in the upper part of the Pars Petrosa, with its convex side upwards.

The *Posterior* is farther back than the former one, and is parallel to the length of the Pars Petrosa, with the convex side turned backwards.—One of its extremities is placed above, and the other below, the upper extremity joining with the internal one of the Vertical Canal, by which a common Passage is formed.

The *Exterior*, less than either of the other two, which are more of an equal size, is placed next the Tympanum, and has its extremities and curvature nearly upon the same plane;—with the convex part of the curve placed backwards.

Each of the Canals forms upwards of three fourths of a Circle, can admit the head of a small Pin, and has a slight Dilatation, an *Ampulla*, or *Cavitas Elliptica*, at one end, the other extremity being nearly of the same size with the rest of the Canal.

The *Orifices* are only five in number, two of the Canals having a common termination. Of these Orifices, three are situated at the inside, and two at the outside of the Vestibule, into the posterior part of which the different Canals open, without being closed by any Membrane.

In the bottom of the Meatus Auditorius Internus, which is situated in the posterior Surface of the Pars Petrosa, there is a large under, and a small upper *Fossula*, separated by a sharp Ridge.

The fore part of the inferior Fossula leads towards the Cochlea, and is perforated by numberless *minute Holes*, through which Branches of the Portio Mollis of the Seventh Pair of Nerves pass to the Cochlea.

One Hole in the Centre, larger than the rest, transmits a Branch of that Nerve to the Infundibulum. This Hole, however, is frequently seen enlarged, in consequence of the Bone, which is extremely thin, being broken while preparing it.

In the back part of the inferior Fossula, four or five *Cribriform Holes* appear, for the transmission of Branches of that part of the Portio Mollis destined for the Vestibule and Semicircular Canals.

In the upper Fossula of the Meatus Internus, there are *two Passages*, one posterior and smaller, transmitting Nerves into the Elliptical Cavity of the Vestibule.

The other, the anterior and larger, is termed *Canalis* vel *Aquæductus* FALLOPII,—from a resemblance it bears to an Italian Aqueduct; and serves for the transmission of the Portio Dura of the Seventh Pair of Nerves.

The *Canal* of FALLOPIUS goes through the upper part of the Pars Petrosa, passes downwards and backwards between the Fenestra Ovalis and external Semicircular Canal, and terminates by the Foramen Stylomastoideum.

In its passage through the Pars Petrosa, it communicates with the Foramen Innominatum, situated on the upper and fore part of that Bone.

In Children, the Labyrinth is almost as large as in Adults, its substance complete and hard, while the Bone which surrounds it is soft and spongy, on which account it is easily separated from the rest of the Pars Petrosa.

The different Cavities and Passages of the Labyrinth are lined with the Periosteum, which in the Vestibule fills the Fenestra Ovalis, and of consequence covers the Base of the Stapes.

The Periostea lining the two Canals of the Cochlea, by their union, assist in forming the Membranous Portion of the Lamina Spiralis, which, together with the Osseous part, completes the Septum between the two Scalæ.

The Periosteum of the Cochlea also assists that of the Tympanum in forming the Membrane of the Fenestra Rotunda, which is sometimes called *Membrana Tympani Secundaria*, from a resemblance to the Membrana Tympani, and from being also, like it, a little concave on the outer, and convex on the inner Surface, or where it faces the Scalæ to which it belongs.

Besides the Periosteum, the Vestibule, Cochlea, and Semicircular Canals, contain a *Pulpy Membrane*, or there is a Membranous Labyrinth, upon which the Portio Mollis is regularly dispersed.

In the Vestibule, the Pulpy Membrane forms a Sac, called *Sacculus Vestibuli*, in shape resembling that of the Osseous Cavity which contains it, and which is described and beautifully delineated by Scarpa.

When the Sac is laid open upon the upper and outer part, a *Partition* appears, partaking of the nature of the Sac, and termed by Dr Meckel, *Septum Vestibuli Nervoso-Membranaceum*.

In the Cochlea, the Pulpy Membrane is in contact with the Periosteum, but can be separated from that Membrane without much difficulty.

In the Semicircular Canals, it is at some distance from the Periosteum of these Bones, and is considerably smaller; and forms distinct Tubes, which communicate with the Sacculus Vestibuli. Like the Osseous, each of the Membranous Canals also forms an Ampulla or Elliptic Cavity, at one end.

The *Arteries* of the Labyrinth arise by one or two small branches, chiefly from the Vertebral Artery, and pass through the Cribriform Plate, at the bottom of the Meatus Internus which belongs to the Labyrinth.

From the Labyrinth one or two *Veins* return, and terminate in the end of the Lateral Sinus.

The Cavity of the Vestibule is constantly filled with a *Watery Fluid* called *Aqua Labyrinthi*, supposed to be secreted from the Arteries of the Periosteum, and which is found to resemble the Aqueous Humour of the Eye.

The Aqueous Fluid fills the Vestibule and Scalæ of the Cochlea, and likewise surrounds the Membranous Semicircular Canals.

The *Aqua Labyrinthi* is considered as a medium by which sounds are communicated from the Membrane filling the round and oval Holes, and from the Base of the Stapes to the Pulpy Membrane placed in the Labyrinth.

The superfluous part of the Aqua Labyrinthi is supposed by COTUNNIUS to be carried off by two small *Conical Ducts*, more particularly described by him than by some preceding Anatomists, who were partly acquainted with them, but considered them as Blood-vessels.

One of the Aqueducts of COTUNNIUS, called *Aquæductus Cochleæ*, begins at the under part of the Scala Tympani, near the Fenestra Rotunda, and, after passing through the Pars Petrosa, is seen, in the figures he gives of it, terminating by a wide triangular Opening, upon the Surface of the Dura Mater, between the passages of the Seventh and Eighth Pair of Nerves.

The other Duct, called *Aquæductus Vestibuli*, begins under the termination of the Common Canal in the Vestibule, from which it descends, and terminates by a Triangular Opening between the Layers of the Dura Mater, behind the Meatus Internus, and half way between the upper edge of the Pars Petrosa and Diverticulum of the Internal Jugular Vein.

The *Nerves* of the Labyrinth are derived entirely from the Auditory or Seventh Pair.

The *Auditory Nerve* is composed of two Branches, one of which is called *Portio Dura*, and is harder than the other, termed *Portio Mollis*.

The Trunk of the Auditory Nerve passes into the Meatus Internus, covered by the investing Membranes of the Brain.

The *Portio Dura* goes through the Canalis FALLOPII, sending off Branches through Perforations in the sides of the Canal, to the Stapedius, and to the Mastoid Cells.

One *reflected Branch*, from the second part of the Fifth Pair, passing through the Foramen Innominatum in the Pars Petrosa, forms a connexion with the Portio Dura.

A Branch from the Portio Dura, called *Chorda Tympani*, passes across the Cavity of the Tympanum, between the Inferior Crus of the Incus and Handle of the Malleus, and, after running along the outside of the EUSTACHIAN Tube, joins the Lingual Branch of the Fifth Pair. In its passage, it supplies the Malleus, and Membranes, &c. of the Tympanum.

The remainder of the Portio Dura is dispersed upon the Face.

The *Portio Mollis* is divided into two principal parts,

—one to the Cochlea, the other to the Vestibule and Semicircular Canals.

The Branches to the Cochlea pass through the Cribriform Plates of the Modiolus, to the Pulpy Membrane lying on the Scalæ.

The Branches run between, and likewise on the outside of the Partitions which divide the Cochlea into Gyri, and the Gyri into Scalæ, and are large and numerous in proportion to the part they supply.

The largest and most numerous of these Branches are dispersed upon the Lamina Spiralis, where they form an intricate Plexus, the threads of which are at first opake, but are afterwards of the colour of the Retina of the Eye.

The Branches terminate, and appear almost to meet, upon that part of the Pulpy Membrane which is most distant from the Modiolus.

Through the Cribriform Plate, common to the Modiolus and Infundibulum, the last Branches of this Portion of the Nerves pass to be spread out upon the Membrane lying within the Infundibulum.—*For a particular description of that part of the Portio Mollis distributed to the Cochlea, and of the Cochlea itself, see* DR MONRO's *Treatise on the Ear.*

Of that part of the Portio Mollis destined for the Vestibule and Semicircular Canals, one Branch goes through the posterior Hole in the upper part of the Meatus Internus; the rest pass through the Holes in the under and back part of the Meatus, already pointed out in the description of that passage.

Having perforated the Foramina, the Nerves are seen first in distinct Plexus, after which they become transparent, and are lost upon the Sac contained in the Vestibule, and upon the Ampullæ of the Membranous Semicircular Canals.

The *Portio Mollis*, spread out upon the Pulpy Membrane of the Labyrinth, is the primary part of the Organ of Hearing, to which all the other parts are subservient, and may be regarded as being of the same service to the Ear, as the *Retina* is to the Eye.

Sound is conveyed to the Portio Mollis, by the External Ear, the Cartilage being well fitted for reflecting it to the Meatus Externus, and Membrana Tympani. From these it is conducted inwards by the small chain of Bones in the Tympanum, by the Membrana Tympani Secundaria, by the walls of the Tympanum and Labyrinth, by the Bones of the Head in general, and by the Aqua Labyrinthi, which communicates the tremor directly to the Pulpy Substance of the Nerve.

TAB. XXII

Fig. 1.

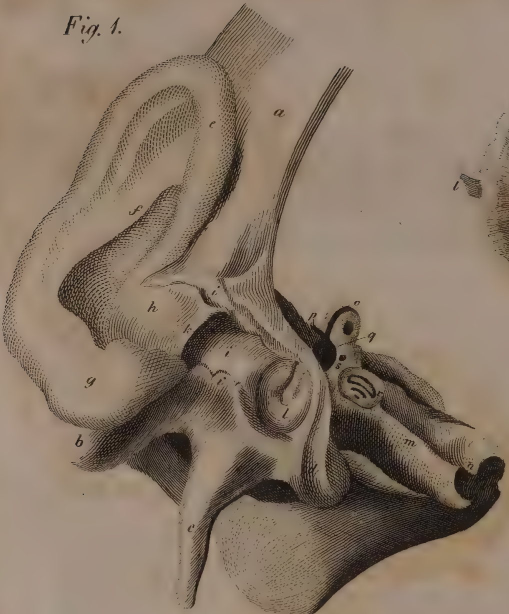


Fig. 2.

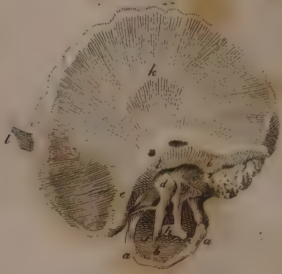


Fig. 3.

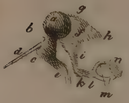


Fig. 4.

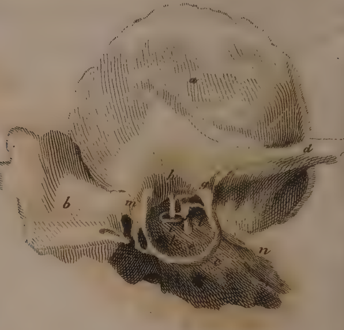


Fig. 5.

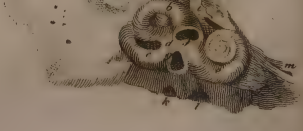


Fig. 6.

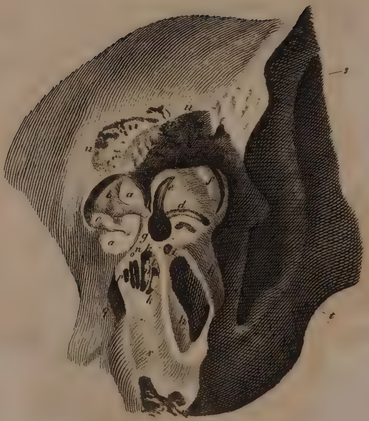


TABLE XXII.

VIEWS of the EAR. All the Figures belong to the Right Side of the HEAD.

FIG. 1.

The EAR, *seen from its outer and Fore Part, in a dried Preparation.*

a, A portion of the squamous part of the temporal bone.
b, The mastoid, and,
c, The styloid processes.
d, The under end of the condyloid or articular cavity, concealing the passage of the carotid artery, and internal jugular vein.
e, *f*, *g*, *h*, The outer ear; *e*, the helix; *f*, The antihelix; *g*, The lobe of the ear; *h*, The concha.
i, *i*, *i*, The meatus auditorius externus, laid open to its bottom.
k, The connexion of the cartilage of the ear to the osseous part of the meatus externus.
l, The membrana tympani, fixed in an osseous groove at the inner end of the meatus auditorius, and hollow near its middle, where it is connected to the under end of the malleus, which is seen shining through it.
m, A section of the carotic canal.
n, The point of the pars petrosa.
At the inner side of the membrana tympani, the labyrinth is exposed, with its passages laid open, of which the following appear in this view; viz.
o, The superior or vertical semicircular canal.
p, The external or horizontal semicircular canal.

q, The vestibule.
r, *r*, The cochlea.
s, The beginning of the canalis FALLOPII, or the passage for the portio dura of the seventh pair of nerves.

FIG. 2.

The MEMBRANA TYMPANI, *with the* SMALL BONES *of the* EAR, *seen from the Inner and Fore Part; the* PARS PETROSA *being removed.*

a, *a*, The ring of bone which incloses the membrana tympani.
b, The membrana tympani inclosed in that ring.
c, Part of the tympanum.
d, *e*, *f*, The malleus; *e*, Its long process; *f*, The point of the manubrium or handle of the malleus, bent towards the membrana tympani, and connected with it.
g, The incus, connected to the head of the malleus.
h, The basis of the stapes, the other parts of the bone being concealed in this fore-shortened view.
i, *i*, The part where the pars petrosa was joined with the pars squamosa.
k, The squamous part.
l, The zygomatic process.

FIG. 3.

Shews the Natural Size of the SMALL BONES *of the* EAR, *and their* ARTICULATION *with each other.*

a, *b*, *c*, *d*, *e*, The malleus; *a*, Its head; *b*, Its neck or collar; *c*, The short process; *d*, The long or slender process; *e*, The manubrium, or handle, with its point bent outwards and forwards.

f, *g*, *h*, *i*, The incus; *f*, Its body; *g*, The cavity which receives the head of the malleus; *h*, Its short crus; *i*, Its long crus.

k, The os orbiculare, vel subrotundum.

l, *m*, *n*, The stapes; *l*, The apex, or head, with a small cavity, which corresponds with the os orbiculare; *m*, The crura, of which one is longer than the other; *n*, The basis, which was fixed in the fenestra ovalis of the labyrinth.

FIG. 4.

The Temporal Bone *of a* Child, *viewed from the Outer, and a little towards the Under Side:—the Membrana Tympani being removed.*

a, The squamous plate.

b, The part which afterwards forms the mastoid process.

c, The pars petrosa.

d, The zygomatic process.

e, The tympanum.

f, The handle of the malleus.

g, The long process of that bone.

h, The long process, or crus of the incus.

i, The stapes, with its basis fixed in the fenestra ovalis.

k, The fenestra rotunda.

l, A groove for lodging the tensor muscle of the tympanum.

m, The foramen stylo-mastoideum, for the passage of the portio dura of the seventh pair of nerves.

n, Part of the Eustachian tube.

FIG. 5.

The LABYRINTH *shewn, by removing that part of the* TEMPORAL BONE *which covers it.—This viewed from the Outer Side.*

a—g, The labyrinth.

a, b, c, The three semicircular canals; *a*, The superior, or vertical; *b*, The exterior, or horizontal; *c*, The posterior, or oblique.

d, The vestibule.

e, The cochlea.

f, The fenestra ovalis.

g, The fenestra rotunda.

h, The margin to which the squamous part of the temporal bone was connected.

i, Part of the tympanum.

k, The jugular fossa.

l, The canalis caroticus.

m, Part of the EUSTACHIAN tube.

FIG. 6.

The TYMPANUM *and* LABYRINTH *viewed from the Upper and Fore Part, after removing the Osseous Substance which covered them.*

a, a, The membrana tympani, with the light shining through it from the outside; shewing at the same time the boundary of the tympanum.

b, The incus, with the os orbiculare at its under extremity; the stapes being removed, to procure a view of the vestibule.

c, The malleus, joined to the incus, and to the membrana tympani.

d, *e*, *f*, The three semicircular canals laid open; *d*, The vertical canal.

g, The vestibule also laid open.

h, *h*, A section of the meatus auditorius internus.

i, The beginning of the canalis FALLOPII.

k—*p*, The different turns of the cochlea; *k*, *k*, The scalæ; *l*, The lamina spiralis, complete behind; the osseous part only is represented before; *m*, The modiolus; *n*, The partition between the first and second gyri or turns of the cochlea; *o*, The second gyrus of the cochlea, in which are seen the two scalæ, with the lamina spiralis between them; *p*, The infundibulum, with the hamulus, or termination of the lamina spiralis, projecting in it.

q, The passage of the internal carotid artery.

r, The point of the pars petrosa.

s, *t*, The passage of the lateral sinus; *t*, The part where it goes through the cranium.

u, *u*, The cells of the bone.

OF THE NOSE.

THE *NOSE* is divided into the External Prominent Part, and the Internal Cavity, which is separated by the Septum Narium into two smaller Cavities;—or it is divided into hard and soft Parts.

The External Part, or Nose properly so called, is composed superiorly of Bones, inferiorly of Cartilages, and has a partial Covering from the Muscles, and a general one from the Common Integuments.

On the outside of the Nose are observed,—the *Radix*, or upper part;—the *Dorsum*, or middle prominence; —the *Apex*, or point;—the *Alæ*, or lateral moveable parts, and *Columna*, or inferior part of the Partition next the Upper Lip.

The Osseous part of the Nose is formed by the *Os Frontis*, *Ossa Nasi*, and *Ossa Maxillaria*, which constitute the upper and fore part:

By the *Os Ethmoides* and *Ossa Unguis*, which form the upper, inner, and lateral parts:

And by the *Ossa Maxillaria Superiora, Ossa Palati, Os Sphenoides, Ossa Spongiosa Inferiora,* and *Vomer,* which form the under, inner, and back parts.

The *Two Cavities,* or *Nostrils,* terminate anteriorly in the Face, and posteriorly in the Fauces, and are much enlarged by the different Sinuses which communicate with them.

The under and fore part of the Nose consists of *Five Cartilages,* of a somewhat regular figure, and of some smaller pieces, which are more irregular, and of an indeterminate number.

Of the five Cartilages, one is situated in the middle, and the other four laterally.

The middle Cartilage is the most considerable, and supports the rest: It constitutes the Cartilaginous part of the Septum Narium, and is joined to the anterior edge of the Nasal Lamella of the Ethmoid Bone, to the anterior edge of the Vomer, and to the fore part of the Spinous Process of the Superior Maxillary Bones.

Of the lateral Cartilages, two are placed anteriorly, forming by their curved union the tip of the Nose; and two posteriorly, which form the Alæ Nasi.

Between the anterior and posterior Cartilages, are Spaces filled with additional Cartilages, the number, size, and figure, varying in different Bodies.

The Elasticity of the Cartilages contributes to the defence of the Nose against external injuries.

The Nose is covered by the Common Integuments, which are perforated, especially at the under and outer parts of this Organ, by the Ducts of Sebaceous Glands, the contents of which may be readily squeezed out by the pressure of the Fingers.

The Cartilages of the Nose are moved in different directions, by the following Muscles on each side, which have already been described; viz. the *Compressor Narium*, the *Nasal* part of the *Frontal* Muscle, and the *Levator* and *Depressor Labii Superioris Alæque Nasi.*—The Nose may also be moved by the neighbouring Muscles, which, in many instances, become assistants to the others.

The Internal Nares, or Cavities of the Nose, extend upwards to the Cribriform Plate of the Ethmoid, and to the Body of the Sphenoid Bone.

At the inner side, they are bounded by the Septum Narium, which is formed by the Nasal Lamella of the Ethmoid Bone, by the Vomer, and by the middle Cartilage of the Nose.

On the outside, or that next the Cheek, the Ossa Spongiosa project a considerable way into the Cavities of the Nares, and increase the Surface of the Membrane of the Nose for enlarging the Organ of Smell: In Animals which smell acutely, the Ossa Spongiosa are remarkably large and complex.

The bottom of the Nostrils runs directly backwards, or goes in a horizontal direction in the erect position of the Body, so that a straight Probe may be passed through either of them to the Throat.

In the fore part of the Nostrils there are stiff Hairs, called *Vibrissæ*, which prevent the Mucus from constantly flowing, and insects or other extraneous matter from entering.

The general Cavity of each Nostril is divided by the Ossa Spongiosa into *three Meatus*, or *Passages*, which run from before backwards, and are described by HALLER, according to their situations, viz.

The *Meatus Narium Superior*, placed at the upper, inner, and back part of the Superior Spongy Bone.

The *Meatus Medius*, situated between the Superior and Inferior Spongy Bones.

The *Meatus Inferior*, situated between the Inferior Spongy Bone and bottom of the Nose.

The inside of the Nose is lined by a thick Spongy Substance, termed *Membrana Mucosa*, or *Membrana Pituitaria* of SCHNEIDER, or *Membrana* SCHNEIDERIANA, which adheres to the Periosteum, and is also continued into the different Sinuses, to the Lacrymal Sacs and Palatine Ducts, to the Pharynx, Palate, and EUSTACHIAN Tubes.

This Membrane is very *Vascular* and *Nervous*, and is the Primary Organ of Smelling. It is constantly lubricated and preserved in a proper degree of moisture by the *Mucus* of the Nose, which is discharged from numerous small Follicles, every where dispersed over the Surface of that Membrane.

The *Passages* of the different Sinuses of the Bones of the Head, after having run obliquely backwards in a short winding direction, terminate by small openings in the Cavity of the Nose.

The *Frontal Sinuses* send Passages downwards to the anterior Ethmoid Cells, which terminate in the upper part of the Nose, behind the beginning of the Lacrymal Sacs.

Besides the Passages common to the Frontal Sinuses and anterior Ethmoid Cells, there are others proper to the posterior Ethmoid Cells, which terminate in the upper and back part of the Nose, near the openings of the Sphenoid Sinuses.

The *Sphenoid Sinuses* open, behind the Cells of the Ethmoid Bone, into the upper and back part of the Nose.

The *Maxillary Sinuses* open at their upper and inner sides, each by one, and sometimes by two Passages, into the middle of the space between the Superior and Inferior Spongy Bones, nearly opposite to the under edge of the Orbit.

At the upper part of the Maxillary Sinuses, *Appendices*, described by HALLER, are sometimes found, which communicate with the Ethmoid Cells.

The Sides, or Walls of the Maxillary Sinuses, are formed of thin Plates of Bone, excepting where the Processes project and give them additional strength; and below, the Bone is so thin between them and the Dentes Molares, that the roots of these Teeth are sometimes found to perforate the Septum.

The different Sinuses are lined by a continuation of the *Membrana* SCHNEIDERIANA; but in these it is much thinner, and less Vascular and Nervous, than that part of it which lines the general Cavity of the Nose.

They are constantly moistened, but not filled with a Fluid.

Their Passages, being directed backwards, prevent extraneous matter from getting into them.

Lacrymal Groove.—This is formed by the Superior Maxillary, Lacrymal, and Inferior Spongy Bones. In its descent, it runs a little obliquely backwards to the lower and lateral part of the Cavity of the Nose, where it terminates at the inner and fore part of the Antrum Maxillare, under the Os Spongiosum Inferius, a little behind the anterior extremity of that Bone, and in a direct line upwards from the second Dens Molaris.

The upper part of the Groove forms only a semi-canal, the under end a complete one.

The *Lacrymal Sac* is a Membranous Canal, situated in the upper part of the Lacrymal Groove, behind the Tendon of the Orbicularis of the Eye-lids; about a fourth part of it above the Tendon, and forming a kind of Intestinum Cæcum, and the rest below it.

Towards the inner Angle of the Eye, behind the Tendon of the Orbicularis, the Sac is perforated by the Lacrymal Ducts.

The continuation of the Sac becoming a little narrower, but without possessing any Valve, passes into the Nose, under the name of *Canalis Nasalis*, *Ductus ad Nasum*, or *Lacrymal Duct*, and terminates at the inferior extremity of the Osseous Canal, by a round Aperture, large enough to admit the blunt end of a Surgeon's Probe.

The Structure of the Lacrymal Sac and Duct is similar to that of the Membrana SCHNEIDERIANA. They are defended by the same kind of Mucus with which this Membrane is lubricated, and are firmly connected to the Periosteum of the Osseous Canal.

The *Use* of this passage is,—to convey the superfluous Tears to the Nose, so as to prevent them from passing over the Cheek.

The *Ductus Incisivus*, vel *Nasalo-Palatinus* of STENO, is a small Canal, which, as has already been observed in the Description of the Bones, is only sometimes met with in the Human Body, and even then it is very minute; though it is always to be found, and of considerable size, in the Ox, Horse, Sheep, &c.

When present, it takes its origin from a small Pit, formed in the fore part of the bottom of the Nostril, under the termination of the Lacrymal Duct. It runs obliquely downwards and forwards, placed in such a manner as to receive and conduct the Tears into the Mouth.

The *Arteries* of the Nose come chiefly from the External Carotids.

Those of the outer part of the Nose come from the Facial and Internal Maxillary Arteries;—those of the inner from the Internal Maxillary; and a few Twigs are furnished by the Ocular Arteries.

The *Veins* go to the External Jugulars. They likewise communicate with the Ocular Veins, and of course with the Lateral Sinuses and internal Jugulars.

The *Nerves* with which the outer part of the Nose is chiefly supplied, come from the second Branch of the Fifth, and from the Portio Dura of the Seventh Pairs.

The inner part is principally supplied by the First Pair, or Olfactory Nerves, and by some Branches from the first and second Portions of the Fifth Pair.

The Nose constitutes the Organ of Smelling,—contributes to the general purposes of Respiration and the modelling of the voice,—receives the superabundant humours from the external surface of the Eyes, and adds to the beauty of the Face.

The Sense of Smelling is performed by means of the Nerves dispersed upon the SCHNEIDERIAN Membrane of the Nose. The Mucus defends the Nerves, which are almost naked, from the Air which is respired. By this Fluid they are kept moist, and free from pain; but, by becoming acrid, it irritates them, and excites sneezing for its removal.

The Air, filled with subtile Effluvia of Odorous Bodies, is, by the power of Inspiration, drawn through the Nose, and applied to the Pulpy Extremities of the Nerves, in which the Sensation is excited termed *Smelling.*—By this Sense, the several kinds of Odoriferous Bodies are distinguished, and the more readily, in proportion to the extent of the Mucous Membrane.

Of the different parts of this Membrane, that covering the Septum Narium and Ossa Spongiosa appears to be the principal seat of the Organ of Smelling, since upon it the greater part of the Nerves of the Internal Nares are distributed; and this part of the Membrane, and the Bones it covers, are expanded and multiplied, in proportion to the acuteness of Smell, in quick-scented Animals.

The Sinuses leading into the Nose increase and modulate the Voice; their hollow structure renders the Bones lighter; they separate a Fluid, which assists in lubricating part of the Nose, but do not appear to constitute part of the Organ of Smelling.

TAB. XXIII.

Fig. 1.

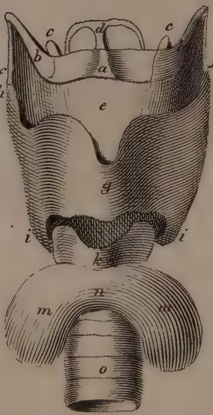


Fig. 2.

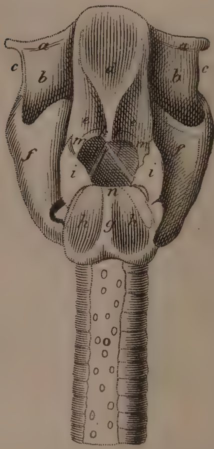


Fig. 3.

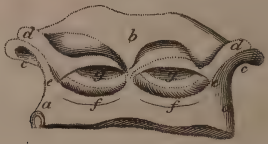


Fig. 4.

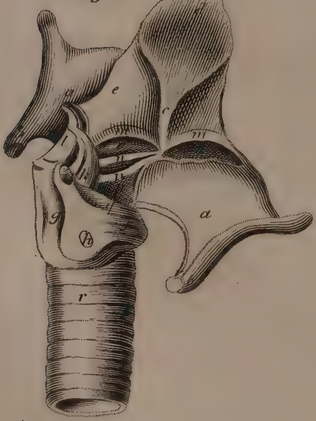


Fig. 5.

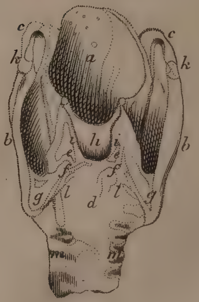


TABLE XXIII.

VIEWS of the LARYNX.

FIG. 1.

A Front View of the LARYNX, *with the Upper Part of the* TRACHEA, *and the* THYROID GLAND.

a, *b*, *b*, *c*, *c*, The os hyoides;—*a*, Its body;—*b*, *b*, Its cornua;—*c*, *c*, Its appendices.

d, The epiglottis.—The letter is placed upon a ligament which ties it to the tongue and os hyoides.

e, The ligament which fixes the os hyoides to the thyroid cartilage.

f, *f*, Round ligaments fixing the cornua of the os hyoides to those of the thyroid cartilage.

g, The thyroid cartilage; the letter is placed upon that part of it called *Pomum* ADAMI.

h, *h*, The superior cornua of the thyroid cartilage.

i, *i*, The inferior cornua, joined to the cricoid cartilage.

k, The cricoid cartilage.

l, A ligament fixing the cricoid to the thyroid cartilage.

m, *m*, The two lobes of the thyroid gland.

n, The isthmus of this gland.

o, The cartilages of the upper end of the trachea.

FIG. 2.

A Back View of the LARYNX.

a, *a*, The cornua of the os hyoides.

b, *b*, The broad ligament which fixes the os hyoides to the thyroid cartilage.

c, *c*, Round ligaments fixing the cornua of the os hyoides to those of the thyroid cartilage.
d, The epiglottis.
e, *e*, The lateral ligaments fixing the epiglottis to the arytenoid cartilages.
f, *f*, The hollow cavity of the thyroid cartilage, with its superior and inferior cornua.
g, The cricoid cartilage;
h, *h*, Prints made upon it by the posterior crico-arytenoid muscles.
i, *i*, The arytenoid cartilage of the glottis.
k, *k*, The superior ligaments of the glottis.
l, *l*, The inferior ligaments of the glottis, or ligaments of the glottis vera.
m, *m*, The ventricles of the larynx.
n, The rima glottidis.

FIG. 3.

Part of the LARYNX *inclined forwards; cut longitudinally behind, and expanded, to shew the* APPENDAGES *of the* VENTRICLES *of the* LARYNX.

a, *a*, The upper part of the cricoid cartilage.
b, The epiglottis.
c, *c*, The arytenoid cartilages.
d, *d*, The long crura of the arytenoid glands.—The short crura lie under *e*, *e*, the superior, and *f*, *f*, the inferior ligaments of the glottis.
g, *g*, The ventricles of the larynx.

FIG. 4.

A Lateral View of the LARYNX, *the Inferior* CORNUA *of the* THYROID CARTILAGE *being separated from the* CRICOID, *and turned aside.*

a, a, The interior or posterior surface of the thyroid cartilage.

b, b, Its inferior cornua, separated from the cricoid cartilage, and the right cornu turned aside.

c, d, d, The epiglottis.

e, e, Its lateral ligaments; the right one is separated from the arytenoid cartilage, and turned back along with the corresponding side of the thyroid cartilage.

f, The anterior narrow part of the cricoid cartilage;

g, Its posterior large and thick part.

h, The articulating surface by which it is connected with the right inferior cornu of the thyroid cartilage.

i, The articulating surface of the cricoid cartilage, for the connexion of *k,* the right arytenoid cartilage; the capsular ligament of which is cut, and the cartilage displaced.

l, The left arytenoid cartilage *in situ.*

m, m, The superior, and,

n, n, The inferior ligaments of the glottis.

o, o, The ventricles of the larynx, the right of which is displaced along with the thyroid cartilage.

p, A section of the membrane lining the larynx.

q, A passage leading down to the trachea.

r The trachea.

FIG. 5.

LIGAMENTS *of the Outer and Back Part of the* LARYNX.

a, The epiglottis, in which are seen the orifices of many mucous glands, which exist here, as well as in the membrane which covers the other cartilages of the larynx.

b, *b*, The margins of the alæ of the thyroid gland.

c, *c*, The cornua of the os hyoides, joined to the superior cornua of the thyroid cartilage.

d, The cricoid cartilage.

e, *e*, The posterior concave surface of the arytenoid cartilages.

f, *f*, Ligaments fixing the base of the arytenoid to the cricoid cartilage.

g, *g*, Ligaments between the cricoid and thyroid cartilages.

h, A ligament fixing the arytenoid cartilages to each other.

i, *i*, The proper posterior ligaments of these cartilages.

k, *k*, An osseous granula between each of the superior cornua of the thyroid cartilage and cornu of the os hyoides.

l, *l*, impressions where the thyroid gland adheres.

m, *m*, Cartilages of the beginning of the trachea.

OF THE MOUTH AND THROAT,

WITH THEIR APPENDAGES.

MOUTH.

THE *Osseous Parts* of the Mouth are,—the *Ossa Maxillaria Superiora*, the *Ossa Palati*, the *Maxilla Inferior*, and the *Teeth* :—all of which, except the Teeth, have been already described.

The *Soft Parts* of the Mouth consist of the *Lips* and *Cheeks*, the *Gums*, the *Palate*, the *Velum Palati*, the *Uvula*, the *Tongue*, the *Membrane* lining the Mouth, and the *Salivary Glands*.

The *Lips* and *Cheeks*, which are principally composed of Muscles, are covered on the outside by the common Integuments, and lined within by the Membrane of the Mouth, under which there are numerous Mucous Glands, obtaining their names from their situations.

The Lips possess but a small proportion of Fat, much more of it is found in the Cheeks; and the intervening space between the Masseter and Buccinator is occupied by a large quantity of it, which, while it gives shape to the Face, forms a sort of cushion about the Mucous and Salivary Glands.

The *Membrane* of the Mouth is covered by fine *Villi*; but these are most conspicuous upon the edges of the Lips, as may be distinctly seen after a minute Injection, or after macerating the parts till the Cuticle can be separated.

From the edges of the Lips, the common Integuments, now become extremely thin, are converted into the Membrane which lines the Mouth, and which, opposite to the Dentes Incisores of the upper and under Jaws, forms two Doublings or *Fræna*, which fix the Lips more firmly to the Jaws.

The Lips are serviceable in the general purposes of Speaking, Eating, Drinking, &c.

The *Gums* cover the sides of the Alveolar Border of both Jaws, pass in between the different Teeth, and surround and adhere firmly to the Collar of each.

The Substance of the Gums is of a dense nature, and very Vascular, from which they derive their florid appearance, and the Vessels are united by a compact Cellular Texture.

They may be said to consist of the Common Membrane of the Mouth and the Periosteum of the Jaws, intimately connected.

They serve as a Covering to the Jaws, and contribute to the security of the Teeth.

The *Arteries* of the Lips, Cheeks, and Gums, which are considerable both as to number and size, are from the Facial, Temporal, and Internal Maxillaries, which are derived from the external Carotids.

The *Veins* go chiefly to the External, and partly to the Internal Jugulars.

The *Nerves* come from the first and second Branches of the Fifth Pair, and also from the Portio Dura of the Seventh Pair.

The *Palate*, or Roof of the Mouth, is divided into the *Palatum Durum* and *Palatum Molle*. The former is composed of the Palate-Plates of the Superior Maxillary and Palate Bones, and is covered by the Periosteum and common Membrane of the Mouth, which prevent the Bones from being injured.

The Membrane which covers the Bones of the Palate is remarkably thick, and is marked by a middle longitudinal Line, and numerous transverse *Rugæ*, which assist in the division of the Food.

It is nearly of the same structure with that of the Gums, but perforated by the Ducts of the Palatine Glands, for the excretion of Mucus, which serves to lubricate the Palate, and assists in dissolving the Food.

The *Palatum Molle*, *Velum Pendulum Palati*, or *Soft Palate*, is that part which projects from the posterior edge of the Ossa Palati, and from the Pterygoid Processes of the Sphenoid Bone, over the root of the Tongue, and forms a Musculo-Membranous Partition suspended between the Nose and Mouth.

It is composed of the Membranes which line the Nose and Mouth, and of the Expansions of the Circumflexi and Levatores Palati, and likewise of numerous Mucous Glands, which serve to lubricate the Mouth and Throat, and facilitate Deglutition.

The Palatum Molle conducts the Fluid of the Nose into the Mouth, and acts like a Valve in preventing what we swallow from passing into the Nose.

In the middle of the Posterior edge of the Velum Palati, the *Uvula* or *Pap* of the Throat takes its Origin. It hangs pendulous from the Velum over the Base of the Tongue, and is peculiar to Man and the Ape tribe.

It is of a Conical form, and is covered by the Membrane of the Mouth. Numerous Mucous Glands are found in its Substance, and it has a small Muscle within it, by which it is elevated and shortened;—its other motions depending upon the Muscles of the Palate.

The *Use* of the Uvula, in speaking and in deglutition, is evident from the inconveniences which result from its being destroyed by disease.

The *Arteries* of the Palate, &c. come from the Facial and Internal Maxillary.

The *Veins* go to the External and Internal Jugulars.

The *Nerves* are chiefly from the second of the Fifth, with some Twigs from the Eighth Pair.

TONGUE.

The *Tongue* is of an oval *form*, and is divided into *Base*, *Body*, and *Apex*.

The *Base*, or posterior part of the Tongue, is supported by, and connected to, the Os Hyoides, and, by the medium of this Bone, it is connected to the adjacent Bones and Muscles.

The *Body*, or middle part of the Tongue, terminates anteriorly in the loose moveable point.

On the Dorsum or Upper Surface, there is a *Linea Mediana*, or middle Groove, running longitudinally, and divided into two lateral Convexities.

The inferior Surface, which reaches only from the middle of the Tongue to the point, is connected to the parts below it by the Sublingual Ligament, or *Fræ-num Linguæ*, which is a Doubling of the Skin or Lining of the Mouth.

The sides of the Tongue are fixed to the Lower Jaw, and to the Styloid Processes and parts adjacent, by *Membranous Ligaments.*

The Tongue is chiefly composed of the Fibres of the Muscles, which serve for its motions.—These Fibres are disposed in various directions, and intermixed with Medullary Fat.

The upper and lateral parts of the Tongue are composed of the Stylo-glossi.—Its middle portion, between the two former Muscles, is formed of the Linguales.—The lower part is chiefly formed of the Genio-glossi; and behind, the Stylo-glossi enter into its composition.

The Tongue is covered by a continuation of the Common Integuments, which are preserved soft and moist by the Saliva.

The Cuticle of the Tongue forms Vaginæ for receiving the Substances called *Papillæ,* and is here so remarkably thin, as to be properly adapted to the office these Bodies have to perform.

The Corpus Mucosum of the Tongue is thicker than in other parts of the Body, but more moist.

The third Covering of the Tongue, the Cutis Vera, is plentifully supplied with Nerves.—The Papillæ, which take their origin from it, are very Vascular, especially near the Apex of the Tongue, but are wanting on its under Surface.

The *Papillæ* are divided into three kinds, the *Maximæ*, *Mediæ*, and *Minimæ.*

The first class, called *Papillæ Maximæ*, *Lenticulares*, *Capitatæ*, vel *Vallatæ*, are by much the largest, and of a Lenticular form, having round Heads and short Stems. They are placed at the base of the Tongue, in superficial Fossulæ, and the whole are arranged in such a manner as to form an Angle with its point backwards.

They are Glands of the Salivary kind, and each of them has a small Perforation in the middle of its convex Surface.

Besides the Papillæ Capitatæ, there are numerous *Mucous Follicles*, which cover the greater part of the Surface of the root of the Tongue.

At the root of the Tongue, and behind the Angle formed by the Papillæ Maximæ, there is a Hole called *Foramen Cæcum* of MORGAGNI, by whom it was first described.

It penetrates only a small way into the Substance of the Tongue, and receives the Mouths of several Excretory Ducts which terminate in it.

The second Class, called *Papillæ Mediæ*, *Semi-lenticulares*, vel *Fungiformes*, are much smaller than the former, and are scattered over the upper Surface of the Tongue, at some distance from each other.

They are of a Cylindrical form, supported on a small Pedicle, and terminated by a round extremity.

The third class, called *Papillæ Minimæ*, vel *Conicæ*, vel *Villosæ*, are by much the most numerous, but very minute. They occupy almost the whole upper Surface of the Tongue, becoming gradually shorter at its sides, and are most abundant towards the Apex, where the sensation of taste is most acute.

This and the second class have been supposed to be formed chiefly of the Extremities of Nerves, and to constitute the real Organ of Taste.

The principal Blood-vessels of the Tongue are large in proportion to the size of that Organ.

They are called *Linguales*, vel *Raninæ*, on account of the dark-coloured Branches which appear under the Tongue.

The *Arteries*, which are Branches of the External Carotids, are not found to communicate so freely on the opposite sides of the Tongue, as they do in other parts of the Body.

The *Veins* open chiefly into the External Jugulars.

The *Nerves*, like the Arteries, are large and numerous, and have little connexion on the opposite sides.

They come from the Fifth, Eighth, and Ninth Pairs.

The first set supply the parts next the point of the Tongue, and are therefore considered as being principally concerned in conveying the sensation of Taste.

The second set supply the root, and the third the middle of the Tongue, and are chiefly dispersed upon its Muscles. There is a considerable intermixture, however, among the three sets on the same side.

Besides being the principal Organ of Taste, the Tongue is the chief instrument of Speech, and of the articulation of the Voice.—It also assists in Manducation, Deglutition, Spitting, Sucking, &c.

When a Sapid Body is applied to the Papillæ, they are supposed to be erected, and thereby to render the sense of Taste more acute. In exercising this sense, the substance applied is dissolved in the Saliva, and the Tongue is then pressed against the Palate, the roughness of which renders the impression stronger.

By being constantly moistened, the Papillæ perform also the office of Touch more exquisitely than the dry Cutaneous Papillæ of the other parts of the Body.

Though the Tongue is the principal Organ of Taste, other parts, as the Palate, and even the Pharynx and Esophagus, possess this sense in a certain degree.

SALIVARY GLANDS.

The *Salivary Glands* consist of three large Glands on each side of the Face, viz.—the *Parotid*, the *Submaxillary*, and the *Sublingual*,—besides many small Glands named from the parts to which they belong.

They are of a pale red and yellowish colour, and irregular on their Surface, being of the conglomerate kind. They are divided into Lobes, and each of these into minute Granulæ.

The *Parotid Gland*, which is the largest of the Salivary Glands, is named from its situation near the Ear.

It occupies the whole space between the Ear, Mastoid and Styloid Processes, and Angle of the Lower Jaw.

It extends superiorly to the Zygoma, and anteriorly to the Masseter, part of which it covers, though by a thin expansion only.

The under end of it lies contiguous to the Submaxillary Gland.

It is somewhat of a triangular form, but longest from above downwards; is flattened externally, and is covered by a condensed Cellular Substance, which gives it a whitish appearance. The External Carotid Artery and corresponding Vein, are sunk deep in the Substance of the Gland; and when it is removed, the Trunks of these Vessels, or their divided extremities, with the posterior Belly of the Digastricus, and part of the Sterno-mastoideus, are exposed. Through the Substance of the Gland, also, the Portio Dura passes in its way to the Face.

From the different Lobes of the Gland, numerous small Branches arise, which join together to form a large Duct, sometimes called STENO'S *Salivary Duct*, or *Ductus Superior*, which passes from the upper and fore part of the Gland.

The Parotid Duct is of a white colour, and appears large, but, from the thickness of its Coats, the Cavity is small, in proportion to the general size of the Duct.

It passes forwards and a little downwards over the Masseter, about the middle of its height, where the Muscle is Tendinous, in consequence of which it is free from compression; and, concealed by the Fat of the Cheek, perforates obliquely the Buccinator, and Membrane of the Mouth, by an Orifice without any Papillà, opposite to the Interstice of the second and third Dens Molaris of the Upper Jaw.

Near the fore part of the Masseter Muscle, there is sometimes one, at other times two, small Glands, termed by HALLER *Glandulæ Accessoriæ*, which send an equal number of Tubes into the Parotid Duct; but these are very inconstant.

In the vicinity of the Parotid, some Lymphatic Glands are situated, two of which, more constant than the rest, are placed at its upper and under extremities, which are frequently swelled in scrofulous cases.

The *Submaxillary Gland* is smaller and rounder than the Parotid, and is situated on the inside of the Angle of the Lower Jaw, between it and the Tendon of the Digastricus, and directly under the Platysma Myoides.

From the upper and fore part of this Gland, a Duct arises, called by some Authors *Ductus* WHARTONI, vel *Ductus Inferior*, which is much thinner in its Coats than the former Duct, but longer.

It passes forwards between the Mylo-hyoideus and Genio-glossus, along the under and inner edge of the Sublingual Gland, and perforates the Membrane of the Mouth at the side of the Frænum Linguæ, behind the Dentes Incisores, by a small Orifice in form of a Papilla.

The *Sublingual Gland* is smaller, longer, and softer, than the Submaxillary, and is flat, and of an oval form.

It is situated under the anterior and lateral portion of the Tongue, its upper edge projecting into the Cavity of the Mouth. It is placed above the Duct of the Inferior Maxillary Gland, and under the Gustatory Nerve, near the Lower Jaw, between the Mylo-hyoideus and Genio-hyo-glossus; the former of which sustains it.

Its extremities are turned forwards and backwards, and the edges obliquely inwards and outwards.

It is covered by a continuation of the Skin of the under side of the Tongue, which fixes it in its place.

It opens by several Orifices arranged in a line near the Gums, a little to the outside of the Frænum of the Tongue.

Sometimes this Gland sends off a Duct, which communicates with that of the Submaxillary; but generally it is otherwise.

In several Quadrupeds, as the Ape, Horse, and Hog, there is a distinct Duct belonging to this Gland, like that of the Submaxillary.

The smaller Glands of the Mouth are in great numbers, lying between the inner lining of the Mouth and its Muscles, and deriving their names from their situations.

They are much inferior in size to the former, each forming a simple little Lobe, which is somewhat flattened, or Lenticular. Each Gland sends out a Duct, which perforates the Skin of the Mouth, and opens into its Cavity. They consist of—

The *Buccales*, which are dispersed over the whole of the Cheek, but most plentifully near the termination of the Parotid Duct;

The *Molares*, which are in a group, and a part of the Buccal, situated opposite to the large superior Dentes Molares;

The *Labiales*, lying on the inside of the Lips;

The *Palatinæ*, upon the Palate; and

The *Linguales*, vel *Capitatæ*, at the root of the Tongue.

The *Arteries* of the Salivary Glands are from different Branches of the External Carotids.

The Parotid Gland is supplied from the Temporal, the Inferior Maxillary Gland from the Facial, and the Sublingual Gland from the Lingual Artery.

The *Veins* of these Glands go to the External Jugulars.

The *Nerves* are chiefly from the third part of the Fifth, and from the Portio Dura of the Seventh Pairs. The latter Nerve perforates the Parotid Gland in such a manner, that it must unavoidably be divided in the extirpation of the Gland.

The Salivary Glands serve for the secretion of the Saliva, which they pour out in large quantity, and which is promoted by the motion of the Lower Jaw during manducation. The Saliva is found to consist of water, in which are dissolved Albumen, Mucus, and certain Saline Substances, in various proportions.

The Saliva assists in the solution of the Food in the mouth, in lubricating the Throat for its passage downwards, and in the Digestion of it in the Stomach.

OF THE TEETH.

Of the Structure of the Teeth in the Adult.

The *Teeth* are situated in the Alveoli or Sockets of the Jaws, and are sixteen in number in each Jaw, though, in some instances, there is one or two, more or less, which surplus or deficiency occurs chiefly at the fore part of the Jaw.

Each Tooth consists of a *Base*, or *Body*, or *Corona*, and one or more *Roots* or *Fangs*; the former appearing without, the latter within the Sockets.

Around the Surface, where the Body ends and the Root begins, the Tooth is a little contracted where it forms the *Cervix* or *Collar* of the Tooth. The Collar is connected to the Socket, and Gum which closely embraces it; and which being destroyed, from whatever cause, the Teeth are apt to drop out.

The Roots are of a conical form, becoming gradually smaller as they recede from the Body of the Tooth, in consequence of which, pressure is removed from the tender parts placed at their points, and divided equally over the Surface of the Fangs. The Roots are incrusted by a thin covering, of a yellowish tint, harder than the part it incloses, and sometimes called *Horny Substance.*

Upon the Body of each Tooth, there is an additional Covering, termed *Cortex Striata,* or *Enamel,* which is spread over all that part of the Tooth that, in the healthy state, appears beyond the Gums.

The Enamel is of a white colour, insensible, and so hard, that a Saw or File impresses it with difficulty. The action of Fire does not much affect its colour. It is almost completely dissolved by Acids.

It is thicker towards the cutting and grinding Surfaces, and becomes gradually thinner towards the Cervix of the Tooth.

It is composed of Fibres so disposed as to form Radii round the Body of the Tooth; or they are nearly perpendicular to its Surface.

The Fibres are remarkably small and straight on the cutting Edges and grinding Surfaces of the Bodies, but curved at the sides of these, with the convex part turned towards the Fangs of the Teeth, which better enables them to resist the impression of hard Substances placed between them during manducation; nor are they, from this structure, so apt to exfoliate by disease, nor so easily fractured by the inordinate motion of the Jaws.

Near the point of each of the Roots of the Teeth, there is a *Foramen*, and a passage leading from it into a common Cavity in the Body of the Tooth, for lodging the Substance called *Pulp* of the Tooth.

The Foramen is placed towards one side of the point, which prevents the Vessels and Nerves entering here from being injured by pressure.

In old people, the Foramen is sometimes obliterated; in such cases the Vessels and Nerves are destroyed.

The shape of the Cavity resembles that of the Body of the Tooth, being narrow next the Fangs, and gradually expanding towards the opposite extremity.

The Cavity is smooth, and has no Cancelli nor Marrow, being filled with the Pulp, which is inclosed in a fine Membrane, connected to the Tooth by Cellular Substance.

The Pulp consists of minute Vessels and Nerves, intermixed with Gelatinous Matter, the remains of that which gave origin to the Tooth; and which, being exposed, occasions Tooth-ache.

The *Arteries* of the Teeth called *Dental*, are Branches of the Internal Maxillary; the *Veins* returning from them pass into the Internal Jugular Veins.

After the Arteries have entered the Teeth, they are dispersed upon the Membrane which lines their Cavity, as may be seen by injecting them.—The Vascularity of the Teeth is also proved by the appearance produced by age, the Cavity in old people often filling up with Osseous Matter, and the Teeth acquiring a horny transparency;—or where, in some Animals, as the Horse, a Tooth is wanting, and the corresponding Tooth of the opposite Jaw extends so far as to fill the space formerly occupied by the body of the absent Tooth, when the Jaws are closed;—by accident, as when a Tooth is loosened by a blow, the Tooth being sometimes fixed again in its Socket, at other times becoming black, from its nourishing Vessels being destroyed;—by disease, as Exostosis, or in Anchylosis of the Roots of the Teeth, or in some rare cases, of the Roots of one Tooth to those next it; but especially by the Blood which is observed by Dentists to issue from the Cavity of the Teeth in sawing them across, for the purpose of fixing other Teeth.

The *Nerves* of the Teeth are from the Fifth Pair, those of the Teeth of the Upper Jaw being from the Second, and those of the Teeth of the Lower Jaw from the Third Branches of that Pair.

In the Upper Jaw, the Nerves enter through various parts of the Ossa Maxillaria Superiora. In the Under Jaw, the Trunk which furnishes the Dental Nerves is lodged in the inferior Maxillary Canal.

The Nerves which supply the Teeth, though small, can be observed to enter the Foramina at the points of the Fangs, and, by properly preparing the Teeth, can be distinctly traced in their Osseous Canals. In a Fœtus the Nerves can be observed first to form a Plexus, and then to penetrate into the Pulp of the Teeth.

The Absorbents of the Teeth have not been seen, but their existence is proved,—by the Absorption of the Fangs of the Temporary Teeth during the second Dentition;—the removal of part of the Teeth in consequence of ulceration within them;—by the colour given, from the internal use of Madder, to the Osseous Substance of the Teeth, disappearing after the use of it has been for some time discontinued;—by the swelling of the Lymphatic Glands from a Carious Tooth;—and the disappearing of part of the internal Substance of the Teeth of such large Animals as Elephants, where the Tusks have been found with extraneous Bodies forced into, and lodged within them.

The Substance of the Osseous part of the Teeth, like that of Bone in other parts of the Body, is lamellated. It differs chiefly in being harder and more dense, in having its Fibres generally in a longitudinal direction, and in having a partial covering from the Enamel.

The Teeth are fixed in their Sockets by Gomphosis, *i. e.* like a Nail in a Board, and attached to the Alveoli by a strong Periosteum. The Periosteum lines the Sockets, and is reflected upon the Fangs as far as the Necks of the Teeth, where it is intimately connected with the Gums; but all that portion of the Teeth that appears beyond the Gums is destitute of this Membrane.

The Teeth serve to masticate the Aliment, to assist in pronouncing several of the Letters, and are ornamental to the Face.

ANALYSIS *of the* TEETH, *as made by* MR PEPYS *of London.*

100 parts of Enamel yielded,

Phosphate of Lime,	78
Carbonate of Lime,	6
Water of composition and loss,	16
	100

100 parts of the Osseous Substance yielded,

Phosphate of Lime,	58
Carbonate of Lime,	4
Gelatin,	28
Water of composition and loss,	10
	100

So far the Teeth agree in their general structure; but, in consequence of certain differences among them, they are in each Jaw divided into four classes, viz. *Four Incisores*, *Two Cuspidati*, *Four Bicuspidati*, and *Six Molares.*

The *Incisores*, or Cutting Teeth, are placed in the fore part of the Jaw, and have their Bodies formed into Wedges, sloped out behind. Viewed anteriorly, their cutting edges appear broader than the rest of the Tooth; when seen in a lateral direction, they appear thicker towards their roots. Their Fangs, when taken laterally, appear broader than when examined in their anterior or posterior Surfaces. Each has a single Fang, which, in the Upper Jaw, is the longest of any, excepting those of the Canine Teeth.

Their Enamel is thicker on their anterior and posterior Surfaces than at the sides, where it is remarkably thin, and thicker before than on the back part of the Tooth.

The middle Incisores of the Upper Jaw are broader and longer than the lateral ones, and these larger than the Incisores of the Under Jaw, the lateral of which are larger than the middle set.

The Incisores of the Upper Jaw overlap those in the Under one when the Molares are worn down, and act then like Scissars. In this state the Incisores of one Jaw frequently press the Gums from the roots of those of the opposite Jaw, so as to loosen the Teeth in their Sockets.

The *Cuspidati*, vel *Canini*, are placed at the sides of the Incisores, are larger than these, and, like them, have their Bases in form of *Wedges*, but *pointed* in the middle.

The Enamel covers more of these than of the Incisores, and is more equal in thickness all around the Teeth.

The Fangs are thicker, larger, and more depressed at the sides, than those of the Incisores, and appear broadest when viewed in a lateral direction.

The Roots of the Canini are the longest of any, and being also the largest, they project more in the Jaw, as is obvious both to the sight and touch; hence the Incisores and Canini are almost in a straight line, especially in the Under Jaw. The Canini have each commonly but one long root, which is crooked at the point. In some rare cases they have two. They somewhat resemble the Tusks of Carnivorous Quadrupeds, especially those of the Dog tribe, from which they have got their name.

The two of the Upper Jaw are a little larger and longer, and have their roots more crooked than those of the Under one.

In the Upper Jaw, they are placed immediately under the Orbitar Plates, and are termed *Eye-Teeth*, from a supposed connexion with the Eyes. The two below are placed almost as deep as the Base of the Bone, and are called *Angular Teeth*, from supporting the Angles of the Mouth.

The *Bicuspidati*, formerly termed *Small Molares*, or *First* and *Second Grinders*, are situated behind the Cuspidati, and bear an intermediate resemblance to these and the Molares.

Viewed in the Jaws, they are somewhat like each other, and not unlike the Cuspidati. The body of each has two points upon the middle of its grinding Surface, one external, the other internal; and those in the Upper Jaw are nearly upon a level. In the Under Jaw, the points project most on the outside of the Teeth.

The Enamel is nearly equal in thickness round the Body of the Tooth, but is thinner at the sides than on the Cuspidati.

The Fangs resemble two Fangs united, with a depression between them; sometimes, however, the Bicuspidati of the Upper Jaw have distinct roots.

The Bicuspidati of the Under Jaw are smaller than those of the Upper one, the points on their grinding

Surfaces are not so distinct, and the Teeth themselves have a slight inclination inwards in the Jaws.

The *Molares*, or *Grinders*, formerly termed *Large Molares*, which are the most numerous but shortest of any, are behind the Bicuspidati. They are the largest of the Teeth, and have broad Bases with several points. The roots divaricate from each other, and have partitions of the Sockets between them, which assist in lessening the pressure on their points during Manducation. They have thinner Enamel than the other Teeth.

The first of the Molares of the Under Jaw has five, and each of the others has four points.

Each has two roots, one placed forwards, the other backwards, and these are flat and broad, their flat Surfaces facing anteriorly and posteriorly. Sometimes there are three roots.

In the Upper Jaw, the first Molaris has four, and each of the others only three points.

In the two anterior Molares of the Upper Jaw, there are generally three roots, of which two are on the outer side; the third is on the inner side, and placed obliquely, and is the largest and roundest of the three. The roots of the two anterior Molares of the Upper Jaw are shorter than those of the Under one, on account of their situation under the Maxillary Sinus; in certain cases, they project some way into it. Sometimes, though rarely, there are four roots.

The Molares above have a perpendicular direction in respect to the Jaw, those below have an inclination inwards, which should be attended to by Dentists in the extraction of the Teeth.

The backmost Molares are termed *Dentes Sapientiæ*, from appearing later than the rest of the Teeth.

They are smaller than the other Molares, and have generally fewer roots; these are often quite indistinct, as if squeezed together; and frequently there is only a single Fang.

The Dentes Sapientiæ of the Under Jaw have frequently curved roots, and are sometimes placed so obliquely inwards, as scarcely to appear beyond the Gums.

The Incisores of the Upper being for the most part much broader than those of the Under Jaw, the other Teeth are thrown farther back than the corresponding Teeth of the Under one; in consequence of which, in well-formed Teeth, when the Jaws are shut, those of the Upper are opposed to the Interstices of the Teeth of the Under one, and the third Molares of the Upper being smaller than those of the Under, allow the Teeth to close even at their posterior parts.

By such a construction, the Teeth are properly adapted to the Manducation of the Food; and one Tooth being lost, its opponent remains useful, by acting upon the parts of the Teeth immediately opposed to it.

OF THE TEMPORARY TEETH.

In a Fœtus of three or four Months after Conception, the Jaws are distinctly formed; but in place of Sockets, there are Grooves running along the Jaws, with impressions within them, forming the origins of the future Alveoli.

The Grooves are narrow and deep at the fore part of the Jaws, and become wider and more shallow towards their posterior extremities.

In the bottom of the Groove of the Lower Jaw, the Inferior Maxillary Vessels and Nerves are placed, which have afterwards a Canal peculiar to themselves.

Within the Alveolar Grooves, there are, at this time, Ridges across, which gradually extend from the bottom and inner sides, forming Arches; and the Cavities becoming deeper, their external Openings contract, till at the time of Birth, when they are almost closed. In consequence of this, considerable pressure can be made in the time of Suction, without injuring the tender Teeth which the Cavities contain.

The Alveoli of the Molares are produced directly before the roots of the Coronoid Processes of the Under Jaw, and in the Bulges or Tubers of the Upper one, and come forwards as the Jaws increase in length and size.

In a Fœtus of about four Months, small Pulpy Processes are found to proceed from the inner Surface of the Gums, and to be lodged in the Alveolar Grooves of both Jaws. These are the Rudiments of the future Teeth.

At this time they are of a Gelatinous or Pulpy nature, resembling in shape the Bodies of the Teeth which are to be formed in them; each contained in a Membranous Capsule proper to itself.

By degrees the Pulp becomes firmer, and extremely Vascular; and having increased nearly to the size of the Body of the Tooth, Bone is deposited upon its extreme points by the Blood-vessels, the Pulp itself continuing to grow for some time after this.

About the fifth or sixth Month, Bone begins to appear on that part of the Tooth which is afterwards to form the cutting Edges and grinding Surfaces, and in as many points as there are Eminences on the Pulp.

The Ossification begins in the Incisores at three points, and in the others at points corresponding with the number of the future points of the Teeth.

The Osseous points gradually increase, unite, and form a layer of Bone, which extends over the Surface of the Pulp to the Necks of the Teeth.

Between the eighth and ninth Month, Ossification is considerably advanced in all the Pulps, and,

In a full grown Fœtus, the outer Shells of five Teeth in each side of each Jaw are found, which are termed *Temporary*, *Deciduous*, *Shedding*, or *Milk Teeth*.

Of these there are in each side two *Incisores*, one *Cuspidatus*, and two *Molares*; besides, there is the Shell of the Anterior Permanent Molaris; but the whole of the Temporary Teeth are much smaller than the corresponding classes in the Adult.

In the Upper Jaw, the points or Eminences of the Shells correspond with the Depressions in the Teeth of the Under Jaw.

After the outer Shell of a Tooth is formed, the Osseous Matter gradually penetrates the greater part of the Pulp, and, having completed the Body, it contracts, and forms the *Cervix*.

Having formed the Cervix, the Cavity of the Tooth is by degrees diminished, and in proportion as it is lessened, part of the Pulp is pushed out or elongated, and assumes the part of the respective Fang. Upon this Pulp also Bone is deposited.

While the Fang is extending, the socket is found to accommodate itself to it, by extending along with it till the Fang is completed.

Where there are two or more Fangs, the Osseous Fibres shoot across at the Cervix, and form the beginning of these, after which the Ossification of each Fang advances in the same manner as that of a Tooth with a single root.

At Birth, the Capsules containing the Pulps of the Teeth can be separated into two Membranes, the external of which is of a spongy and somewhat Vascular nature, and adheres to the Gums, while the internal, smoother and firmer than the other, and extremely Vascular, adheres to the Pulp.

The Membrane of the Pulp derives its Vessels from those of the Gums; the Pulp receives its Vessels from those which enter the Foramina at the points of the Fangs.

The Membrane containing the Pulp is firmly attached to the inside of the Gums, and to the Basis of the Pulp, and has the same form with the Tooth it incloses.

The Vascularity of the Pulp is shewn by Injection, as is also that of the Membrane by which it is covered; and this appearance is rendered still more evident by examining the growing Teeth of large Animals, as those of an Elephant.

That part of the Pulp has the most Vascular appearance which is covered by Bone; but the Osseous Shell is found to adhere so slightly to the Pulp, as to be separated from it without apparent laceration.

The Osseous Matter is formed in Strata, one Layer being added within another, till the Tooth is completed.

After the Osseous Substance is formed, the Enamel is added, which increases in thickness, till within a little while of the time at which the Tooth begins to pass through the Gum.

The Enamel is secreted by the Capsule which contains the Pulp, soon after the Osseous Shell has begun to be formed. It is always thickest where first deposited; of course, it is thicker upon the Body than upon the Cervix.

The Enamel is secreted in the form of a pure white earthy Substance, moistened with a Mucilage, and has much the appearance of crystallization.

The deposition of the Enamel continues nearly as long as the Teeth are contained in their Capsules. It is at first, and even for some time after Birth, so soft, as to be little firmer than Chalk, being easily scraped by the Nail, but soon acquiring a flinty hardness and a striated appearance.

After the Bodies of the Teeth have attained their full size, no addition of Substance is made to the Enamel, the Membrane which produces it being destroyed previous to the appearance of the Teeth beyond the Gums. The Osseous part, on the contrary, continues to grow for a considerable time afterwards, one third of the length of the Fangs being added after the Teeth have first appeared in the Mouth.

While the Teeth are extending in their Sockets, they press upon their Capsules, and occasion an absorption of them; the remains of the Capsules surround the Necks of the Teeth, and are gradually removed as the Tooth is completed.

OF THE ORIGIN AND FORMATION OF THE PERMANENT TEETH.

Of the Permanent Teeth the anterior Molares are first formed, the Pulps being found in a Fœtus previously to its Birth, and are situated in the back part of the Jaws.

The Permanent Incisores and Cuspidati succeed to, and are formed on the inner side of the Temporary Incisores and Cuspidati. They are similar in shape to them, but much larger.

The Bicuspidati, which are much smaller than the Temporary Molares, are formed at the roots of these, thin Osseous Partitions being placed between the two Sets.

The second and third Permanent Molares are formed after the Bicuspidati, and in the same manner with the other Permanent Teeth.

When the rudiments of the Temporary Teeth are somewhat advanced, *New Sacs* are sent off in succession at the under and inner part of the Sacs of the Temporary Teeth of the Upper Jaw, and at the upper and inner part of the corresponding Sacs of the Under

Jaw, the new Sacs lying between those of the Temporary Teeth and the Internal Alveolar Plate, each being on the inner side of the Tooth it is to succeed, and connected to the Gum.—See Dr Blake's Thesis, Edin. 1798.

The Sacs are at first contained in the same Sockets with the Temporary Teeth, and are loosely connected with the Membranes of these.

During the growth of the Jaws, little Nitches are formed in the Internal Alveolar Plate, and these gradually form a distinct Socket round each of the Sacs of the Permanent Teeth.

When the Temporary Teeth have advanced in their Sockets, the Sacs of the Permanent Teeth become elongated, but still remain attached to the Sacs and Gums at the Necks of the Temporary Teeth, each by means of a Process which passes through a small Foramen at the inner edge of the Jaw.

By degrees, as the Alveoli increase in size, the Permanent Teeth get Sockets of their own.

At the time of Birth, Ossification has commenced upon the tips of the Pulps of the anterior Permanent Molares, and there are small Membranous Sacs, containing the Pulps, with the Rudiments of the other two Molares. Ossification commences upon the points of their Pulps some time after, but always first in the Lower Jaw.

In the formation of the second Permanent Molaris, a small Sac is sent back, which is at first contained in the same Socket with the Pulp of the First Molaris; a new Socket is afterwards formed, in which the Pulp of the Second Molaris becomes perfect; this, in a similar way, sends off another Process, in which the Third Molaris is formed.

About four years after Birth, all the Permanent Teeth have got Sockets for themselves, as may be seen by removing the outer Alveolar Plate of the Jaws.

About the sixth year all the Permanent Teeth, excepting the Dentes Sapientiæ, have made considerable progress. Forty-eight Teeth are now present, twenty are commonly seen beyond the Gums, which are to be succeeded by twenty-eight, that at this time lie concealed in the Jaws.

In the eighth or ninth year, the Dentes Sapientiæ begin to be formed.

OF THE APPEARING OF THE TEMPORARY TEETH.

The Temporary Teeth generally begin to appear between the sixth and eighth Month after Birth, the corresponding Teeth commonly appearing about the same time, first in the Under, then in the Upper Jaw, though they frequently appear a little sooner, and often considerably later than this period; the circumstance depending in some measure upon the strength of the Child.

They commonly appear in the following order: First, one of the Central Incisores of the Under Jaw, and soon after the other one: a few weeks afterwards, the Central Incisores of the Upper Jaw pass through; these are soon succeeded by the Lateral Incisores of the Under Jaw, and then by those of the Upper one.

About the sixteenth or eighteenth Month, the anterior Molares of the Under Jaw appear, and are succeeded by those of the Upper Jaw.

The Cuspidati come next in order, and first those of the Under Jaw, which are soon followed by those of the Upper Jaw.

About the end of the second year, or a little later, the second, or posterior Molares, appear, which complete the first Set; though there is a great irregularity with respect to the time at which the Temporary Teeth make their appearance in the Mouth.

OF THE SHEDDING OF THE TEMPORARY, AND THE APPEARING OF THE PERMANENT TEETH.

As the first Set of Teeth do not increase in breadth after they appear through the Gums, a second Set succeed to them, which correspond with the larger size of the Jaw.

About seven years of age is the common time at which Children begin to shed their Teeth, though some shed them a little sooner, others considerably later than this period; and it not unfrequently happens, that some of the first set remain in the Jaws to adult, or even to old age.

The anterior Permanent Molares first appear; soon after this the Temporary Central Incisores of the Under Jaw are removed, and are succeeded by the Permanent Central Incisores, one coming a short time before the other; then the Central Incisores of the Upper Jaw come out, and the Permanent Central Incisores succeed them.

Next the Lateral Incisores are succeeded by the Permanent ones.

Then the first, or anterior Temporary Molares come out, and are succeeded by the anterior Bicuspidati.

Then the Cuspidati and second Temporary Molares are succeeded by the Permanent Cuspidati and posterior Bicuspidati. The second Permanent Molares appear some time afterward. The whole shedding of the Teeth occupies a space of five or six years.

The Dentes Sapientiæ do not appear till between the eighteenth and twenty-first years; sometimes, however, they appear a year or two sooner, and frequently not till some years later.

The number of the Teeth does not increase till between the sixth and eighth years, when the Teeth that first made their appearance through the Gums are shed, and are replaced by others, and more soon begin to appear farther back in the Jaws.

The Second Set of Teeth, it is found, contrary to the opinion of former times, do not push out the first, the second Set being formed in Sockets of their own, and the Fangs of the first Set gradually decaying as the succeeding Teeth grow; the decaying of the Fangs of the first Set being in proportion to the decay of the first Set of Sockets.

The Permanent Teeth arise in Sockets appropriated to themselves, and are inclosed in these Sockets after the Temporary Teeth have been shed.

During the growth of the Permanent Teeth, absorption proceeds in the Fangs of the Temporary Set, which facilitates their removal from the Sockets, and affords a Passage for the Permanent Teeth.

While the Permanent Teeth increase in size, they occupy more space, come forwards, produce a pressure against the Bony partitions placed between them and the Temporary Teeth, and then against the posterior Surface of the roots of these Teeth, till at length the greater portion, or the whole of the parts pressed against, are absorbed.

The Permanent Teeth now come forwards under the Temporary Set, which, by the pressure being continued, soon drop out.

Besides the causes mentioned above, with respect to the shedding of the Teeth, others contribute; for now and then the Temporary Teeth drop out long before the Permanent Teeth appear, and sometimes where they never appear.

That absorption of the first Set is much influenced, however, by the pressure of the second Set, is rendered probable, from the instances where one or more of the Temporary Teeth have been observed remaining in the Jaws for many years, and where, upon examination, no Permanent Teeth have been found to be formed.

In some very rare instances, a third Set of Teeth appear at a very advanced age.

OF THE GROWTH OF THE JAWS.

After all the Temporary Teeth have appeared through the Gums, the Jaws are observed to grow little in the parts the Teeth occupy.

The Lower Jaw receives its greatest increase between the second Temporary Molaris and the Coronoid Process, the lengthened part being destined for the Permanent Molares.

The Temporary Incisores and Cuspidati being much smaller than the Permanent, while the Temporary Molares are larger than the Bicuspidati which succeed them, space is gained for the Front Teeth, which otherwise would be distorted in the Jaws.

The Jaws grow uniformly throughout for about a year after birth, and as far as the Teeth extend, form nearly half of a circle; after all the Temporary Teeth have appeared, the Jaws elongate, so that in the Adult they form half of a long Ellipsis.

The extension which takes place between the last Temporary Molaris and the Coronoid Process, and in the corresponding parts of the Upper Jaw, continues to increase till the eighteenth or twentieth year, the anterior part of the Jaw adapting itself to the Permanent Teeth, but scarcely receiving any additional size.

CHANGES PRODUCED IN THE TEETH AND JAWS AS A PERSON ADVANCES IN LIFE.

By degrees, as a Person advances in life, the Teeth are worn down by Friction during Mastication, and this appears more particularly in those whose Teeth have naturally been so short as not to overlap, but to meet each other at their cutting edges.

While the Teeth are wearing down, the Vessels in their Pulp seem to assume a new action, in consequence of which, additional Bone is formed, the Pulp is absorbed, and this Process continues till their Cavity is obliterated.

In old People, when the Front Teeth overlap each other, and when extraneous Matter, as Tartar, has been allowed to collect, the Gums are apt to be pressed from the sides of the Teeth, in consequence of which, they loosen in their Sockets and appear longer; and the loosening is increased by the Absorption of the Alveoli.

With respect to the Jaws, it is observed that they continue to become larger in proportion to the general size of the Head, till the person arrives at the prime of life.

As age advances, the Teeth drop out, and chiefly from the causes mentioned above.

The Alveolar Process disappears by being absorbed, and the distance between the Nose and Chin becomes considerably decreased.

When the Jaws are now shut, the under projects beyond the upper one, at its anterior part, and in some measure overlaps it, the Jaws being then only opposed to each other behind. In cases of this kind, the Cavity of the Mouth becomes too small for the Tongue, and the food is masticated with difficulty.

OF THE THROAT, &c.

THE *Throat* consists of the *Arches of the Palate*, of the *Pharynx* and *Larynx*, with the *Muscles*, *Vessels*, *Nerves*, &c. which surround them; to these may be added the *Thyroid Gland*.

The *Arches of the Palate* are two in number in each side of the Throat, one of which is termed the *Anterior*, the other the *Posterior Arch*.

They are formed of a Doubling of the Skin, with a few scattered Muscular Fibres.

The *Anterior Arch* arises from the middle of the Velum Palati, at the side of the Uvula, and is fixed to the edge of the Base of the Tongue.

The *Posterior Arch* has its origin likewise from the side of the Uvula, and passes downwards, to be inserted into the side of the Pharynx.

The Anterior Arch contains the Circumflexus Palati, and, with its fellow on the opposite side, forms the opening into the Throat, called *Isthmus Faucium*.

The Posterior Arch has within it the Levator Palati.

Between the Anterior and Posterior Arches, and close by the sides of the Base of the Tongue, the *Amygdalæ*, *Tonsils*, or *Almonds* of the Ears, are situated.

They are of a reddish colour, of an oval form, or somewhat of the figure of Almonds, full of Cells, which communicate with each other, and have large irregular Openings, which convey Mucus into the Throat; the discharge of which is promoted by the motion of the Arches of the Palate and surrounding parts.

The Mucus, secreted from these Bodies, is naturally transparent, but in Inflammatory cases, it frequently assumes a white appearance, and is apt to be mistaken for Sloughs, or Purulent Matter.

PHARYNX.

The *Pharynx*, so called, from its conveying food to the Stomach, and Air to the Lungs, is a large Musculo-Membranous Bag, situated behind the Tongue and posterior Nares. It is somewhat oval, or in form of an irregular Funnel, with the Tube termed *Esophagus* descending from it, and forming the under end of the Funnel.

It is bounded above by the Cuneiform Process of the Occipital Bone, and by the Pterygoid Processes of the Sphenoid Bone, and back part of the Jaws; with all of which it is intimately connected.

The anterior Margins of its Fleshy parts are connected to the edges of the Larynx, and its sides are covered by the great Blood-vessels of the Neck.

The fore part of the Pharynx is formed by a Membrane common to it and to the back part of the Larynx.

Behind, it lies flat upon the Cervical Vertebræ, and upon the Muscles which cover the fore part of the sides of these Vertebræ, to both of which parts it is so slightly connected, that it may be readily separated from them.

It has several *Openings*, by which it communicates with the neighbouring Cavities.

Two of these lead upwards and forwards by the posterior Nares into the Nose: two go laterally by the EUSTACHIAN Tubes to the Ears; one passes forwards through the large Opening termed *Fauces*, or top of the Throat, to the Mouth; one goes downwards and forwards through the Larynx and Trachea, to the Lungs; and another directly downwards by the Esophagus to the Stomach.

The Pharynx is surrounded by a loose Cellular Substance, and consists of different Layers of Muscles, called *Constrictores Pharyngis*, which have been already described.

On the inner side, it is lined by the continuation of the Membrane of the Mouth, which is perforated by the Ducts of numerous Glands, for the Secretion of Mucus.

The lower end of the Pharynx, opposite to the under edge of the Cricoid Cartilage, and Fifth Cervical Vertebra, describes a complete Circle, which forms the beginning of the Esophagus.

The Pharynx is supplied with Blood by the Pharyngeal Branches which come directly or indirectly from the External Carotids. It returns its Blood to both Jugular Veins.—Its Nerves are from the Eighth Pair.

The Pharynx receives the Aliments from the Mouth, and, by the action of its Muscles, conveys them to the Esophagus. It also receives the air we inspire, and must likewise assist in the modification of the Voice.

LARYNX.

The *Larynx*, so called from its being the principal Organ of Voice, forms the anterior part of the Pharynx. It is situated at the upper and fore part of the Neck, immediately under the Os Hyoides, which is placed at the root of the Tongue.

In a Male, the Larynx is proportionally larger, and is also more prominent, than in a Female; before Puberty, however, and in cases of early castration, the size of the Larynx in a Male is more nearly similar to that in a Female.

It is broader above than below, composed of Cartilages, Muscles, Ligaments, Membranes, and Mucous Glands. It is connected above to the Tongue and Os Hyoides; and behind to the Pharynx.

The *Cartilages* of the Larynx are generally considered as being five in number, though, besides these, some choose to enumerate small Projections which are connected with them.

The *Five* Cartilages are,—the *Thyroid*, the *Cricoid*, the *Two Arytenoid*, and the *Epiglottis*.

The *Thyroid*, *Scutiform*, or *Shield-like Cartilage*, is placed at the upper lateral and fore part of the Larynx, and is the largest of the whole. The lateral portions of this Cartilage are somewhat compressed where they are covered by the Thyro-hyoid Muscles.

When spread out, it is of an oblong shape; but in the natural situation, it consists of two lateral Wings or Portions, of a quadrangular form, uniting before in a longitudinal Angle, which can be readily felt in the fore part of the Throat, and which, from its being larger, and projecting more in Men than in Women, has obtained the name of *Pomum Adami*.

The upper part of the Angle is formed into a Notch, from which, and from the upper edge of the Cartilage in general, a *broad Ligament* ascends, to fix it to the under part of the Os Hyoides.

From the posterior Corners four Processes project, called *Cornua*, two of which, termed *Superior*, are long, and ascend to be joined by round Ligaments to the extremities of the Cornua of the Os Hyoides.

In the middle of these Ligaments, one or two small Cartilaginous, or sometimes Osseous Substances, of an oval form, are frequently found.

The other two Cornua, called *Inferior*, are shorter than the Superior, and curved backwards, to be fixed by smooth articulating Surfaces to the side of the Cricoid Cartilage.

The Thyroid Cartilage serves for the protection of the other Cartilages, for the attachment of the Vocal Ligaments, and, along with the Os Hyoides, preserves the passage open, for the transmission of Food to the Stomach.

In old age, this Cartilage is frequently ossified.

The *Cricoid*, *Annular*, or *Ring-like Cartilage*, is placed below, and also behind the Thyroid, and, like it, may be readily felt in the fore part of the Throat.

It is narrow before, where it lies under the Thyroid Cartilage, and thick, broad, and strong posteriorly, where it is placed behind that Cartilage.

The back part of this Cartilage is divided by a longitudinal Ridge into *two Lateral Depressions*, for the reception of the Posterior Crico-arytenoid Muscle.

Its under edge is horizontal, and fixed to the whole circumference of the beginning of the Trachea.

The upper edge slants considerably, or rises between the wings of the Thyroid Cartilage, and has its anterior narrow part fixed to the under edge of that Cartilage.

It has four small Articular Surfaces, with distinct Capsular Ligaments, of which two are placed above, for the articulation of the Arytenoid Cartilages, and two at the under and lateral parts, for the connexion of the inferior Cornua of the Thyroid Cartilage.

The Cricoid Cartilage forms part of the general Tube of the Trachea, constitutes the Base of the Larynx, and gives a firm support to the Arytenoid Cartilages.

The two *Arytenoid Cartilages* are much smaller than the others, and are placed upon the superior, posterior, and lateral parts of the Cricoid Cartilage, at a small distance from each other.

They are of a *triangular* form and a little twisted; and are bent back above, so as to have a broad concave Surface behind, which is occupied by the Arytenoid Muscles.

The anterior Surface of these Cartilages is convex, but upon each convexity there is a small Depression, which is also occupied by Glands.

Their upper Extremities, or Cornua, are turned towards each other, and are now and then found loose in the form of Appendices, which are considered by some Authors as distinct Cartilages, and termed *Cuneiform* or *Tuberculated.*

The Bases are *broad* and *hollow,* where they are articulated by Capsular Ligaments with the Cricoid Cartilage, upon which they are moved in different directions, by the action of various Muscles.

They are connected to each other, and to the adjacent Cartilages, by different Muscles and Ligaments.

The Arytenoid Cartilages form a part of the Opening called *Glottis*, and give attachment to its Ligaments.

The *Epiglottis*, obtaining its name from its situation above the Glottis, is of an oval form when surrounded by its Ligaments and Membranes; but when divested of these, it is found to be narrow below, broad above, and rounded, and slightly notched, at its upper extremity.

It is convex towards the Tongue, and concave towards the Glottis, with its point reflected a little forwards.

It is placed behind the upper part of the Thyroid Cartilage, is situated obliquely over the Glottis, and may be seen and examined in the living Body, by pressing down the root of the Tongue.

Its under end is fixed by a broad and short Ligament to the middle Notch of the Thyroid Cartilage; laterally it is attached by two Ligaments to the whole length of the Arytenoid Cartilages, forming, at this part, the Superior Opening of the Larynx.

It is fixed to the roots of the Os Hyoides and Tongue by a Ligament, which is the Doubling of the inner Membrane running along the middle of its anterior Surface, and forming the *Frænum Epiglottidis*.

It is very elastic, and is much more pliable than the other Cartilages, being of a Cartilago-ligamentous nature.

It is found to have a number of *Fissures* with *Lacunæ* in them, and to be perforated by numerous *Foramina*, which are the Mouths of so many Mucous Follicles, and which are in a great measure concealed by the Membrane covering it.

The Epiglottis breaks the current of Air coming from the Mouth and Nose, and prevents it from rushing too forcibly into the Cavity of the Lungs. Pressed and drawn down by the Tongue and by small Muscles, it defends the Glottis, and shuts it completely in the time of swallowing. After the action of swallowing, it is raised by its own elasticity, and by the root of the Tongue, to which it is fixed; ascending again to its former position.

Ligamenta Thyro-arytenoidea, or *Ligaments* of the Glottis.—From the fore part of the Body of each of the Arytenoid Cartilages, a *Ligamentous Cord*, about three quarters of an inch in length, passes horizontally forwards, to be fixed by its other extremity, at the side of its fellow, to the inner Surface of the anterior Angle of the Thyroid Cartilage.

The *Opening* formed between these Ligaments is called *Glottis*, *Mouth of the Larynx*, and *Rima Glottidis*, and is of a triangular figure, the Ligaments being in contact before, but at a considerable distance from each other at their posterior extremities, the Cricoid Cartilage forming the back part of the triangle.

Under these two Ligaments, there are two others, larger and more distinct than the former, and which are commonly considered as the *Vocal Ligaments*, or the *proper Ligaments of the Glottis*, upon which Voice more immediately depends. They arise from the Base of the Arytenoid Cartilages, and run in the same direction with the former, to be fixed also to the Thyroid Cartilage.

In the Interstice of the Superior and Inferior Ligaments, on each side there is a *Fissure*, which leads to a small Membranous Cavity or Depression, about the size of the point of the little Finger, which has its bottom turned outwards.

These are the *Ventricles of the Larynx*, named after GALEN.—They are chiefly formed by the inner Membrane of the Larynx.

They differ in size in different people, have Mucous Follicles opening into them, and are found to be serviceable in the modulation of the Voice.

On the anterior Surface of each of the Arytenoid Cartilages, there is a small Depression, filled by a *Glandular Body*, which not only covers the fore part of the Cartilage, but is continued over the posterior extremities of the Ligaments of the Glottis.

The *Arytenoid Glands* are larger in some Subjects than in others. They were discovered, and are particularly described and delineated, by MORGAGNI.

The Ligaments which connect the Epiglottis to the Notch of the Thyroid Cartilage, and to the under side of the Os Hyoides, together with one which ties the Base of the Os Hyoides, form a *Triangular Space*, in which are found a quantity of Cellular Substance and Mucous Glands.

The Cavity of the Larynx is lined by a Membrane, which is extremely irritable, and is every where perforated by the Mouths of small Mucous Glands, for the purpose of moistening it.

The Larynx has a number of Muscles, for its different motions, some of which are common to it and other parts of the Body, others are proper to itself; all of which have been already described.

The *Arteries* of the Larynx are the two Superior Laryngeals, which come from the External Carotids, and the two Inferior Laryngeals, which are sent off from the Subclavian Arteries.

The *Superior Laryngeal Veins* return to the Internal Jugulars; the Inferior to the Subclavians, or Superior Cava.

The *Nerves* are chiefly the Superior and Inferior Laryngeals, which are Branches of the Eighth Pair.

The Larynx is subservient to *Respiration*, it forms and modulates the *Voice*, and is also useful in *Deglutition*.

It is the principal Organ of Voice;—for, if a Hole be cut in the Trachea, of sufficient size to allow the Person to breathe freely through it, the power of producing voice is destroyed till the cut is closed.

Voice is formed by the Air, in its passage through the Glottis, acting upon the Ligaments of the Glottis and Cartilages of the Larynx and Trachea, and thus producing a Tremor; and is different in different Persons, according to the form and structure of the Larynx.

The *strength* of Voice is in proportion to that of the Larynx, to the quantity of Air expired, and the narrowness of the Glottis.

A Tone is *acute* in proportion to the small size of the Larynx, to the tension of the parts of the Larynx and Trachea in general, of the Ligaments of the Glottis in particular, and to the contracted state of the Rima Glottidis; all of which circumstances are produced by the Muscles belonging to these parts.—On the above circumstances are supposed to depend the acuteness of the Voice in Females, in Children, and in Eunuchs, where the Larynx is less expanded than in Adult Males.

A Tone is *grave* in proportion to the reverse of the above.

Speech is performed chiefly by the different parts of the Mouth, assisted by the Cavity of the Nose,—the Larynx moving only in a small degree.

When the Air passes through the Larynx without producing a tremor, it occasions a *Whisper*.

When a person speaks during Inspiration, the Voice is thereby very materially altered, and, by practice, may be made to appear as coming from other places than the Mouth of the Speaker; as is the case with those who call themselves *Ventriloquists*.

THYROID GLAND.

The *Thyroid Gland* has its name from its connexion with the Thyroid Cartilage, though more immediately connected with the Trachea.

It is a large mass, but varying in size in different persons; is of a deep red colour, is situated at the under and fore part of the Larynx, behind the Sterno-hyoidei and Sterno-thyroidei, and is proportionally larger in Man than in any other Animal.

It has two triangular Lobes, with their Bases undermost, placed at the under and lateral parts of the Larynx, descending over two or three Rings of the Trachea, and also over part of the Esophagus.

The Lobes are joined by an intermediate portion, called *Isthmus*, which lies across the upper and fore part of the Trachea.

Sometimes a Process from the middle Portion, which may be mistaken for what Haller calls *Levator Glandulæ Thyroideæ*, and Soemmerring, *Musculus Glandulæ Thyroideæ*, ascends between the Sterno-hyoidei, and is fixed to the Os Hyoides.

This Gland has a granulous appearance within, and a Viscid Liquor is sometimes observed in it, which has been supposed by Sabatier, and some others, to lubricate the parts in the neighbourhood.

It is supplied with large Blood-vessels, and with several Nerves, from the superior and inferior Vessels and Nerves of the Larynx. It is likewise furnished with numerous Lymphatics.—But no Excretory Duct has ever been observed to come from it; nor is its office yet understood, though many opinions have been entertained respecting it.

OF THE THORAX.

THE *Thorax*, or *Breast*, extends from the Neck to the Diaphragm, and is divided into *External* and *Internal* parts.

EXTERNAL PARTS OF THE THORAX.

The *External* Parts of the Thorax, besides the common Integuments and Mammæ, are,

The *Muscles*, consisting of the *Pectorales*, *Subclavii*, and under end of each *Platysma Myoides*, which are situated anteriorly.

The *Serrati Magni*, which are placed laterally.

The *Trapezii*, *Latissimi Dorsi*, and numerous other Muscles, placed posteriorly.

The *Inter-costales* and *Sterno-costales*, which are situated, the former between, and the latter on the inner side of the Ribs.

And the *Bones*, consisting of *Sternum*, *Ribs*, and

Dorsal Vertebræ.—All these parts, excepting the Mammæ, have already been described.

MAMMÆ.

The *Mammæ* are two Glandular Bodies, of a hemispherical form, situated on the anterior, and a little towards the lateral parts of the Thorax, adhering loosely by Cellular Substance to the Surface of the large Pectoral Muscles.

The term *Mammæ* is peculiar to the Breasts of Women.—In Men they are called *Mammillæ*; in the Brute kind *Ubera*.

In Apes, and a few other Animals, these parts are placed, as in the Human Body, upon the Thorax; but in the generality of Quadrupeds, they are situated under the Abdomen.

The Mammæ vary in size in different Women, and in the same Women at different periods of life.

In Girls, previous to the age of puberty, they are remarkably small.

About the age of fourteen, at which time the Menses, in this Climate, most commonly begin to appear, they evolve quickly, and become prominent.

Near the commencement of each Menstruation, they increase in size, and diminish immediately after this period.

During Utero-gestation they also increase in bulk, and soon after Delivery arrive at their greatest *extent*; but, after several Gestations, are apt to become pendulous. And this is said to be so much the case among certain Nations, as the Hottentots, that the

Women can suckle their children while carrying them on their backs.

After the age of forty-five, or from that to fifty,—the period when the Menses generally disappear,—they decrease in size, and become soft and flaccid.

Under the Skin there is a large quantity of *Fat*, which constitutes a considerable portion of the bulk of the Mamma. It defends the Glandular part, but is not found to pass into or communicate with the Lactiferous Ducts, which some have asserted.

On the quantity of Fat in the Mamma, much of the Bulk of the Breast depends; from this circumstance, a Woman with small Breasts frequently produces more Milk in suckling, than those whose Mammæ are of a larger size.

The *Glandular* part of the Mamma is of a whitish colour, is of the Conglomerate kind, and therefore irregular in its Substance.

It is composed of Lobes and Lobules, or of a number of smaller Masses or Glands, which are separated by Fat, and these again are divided into still smaller parts, in which the Milk is originally secreted.

Near the centre of the Mamma, but a little towards the outside, is the *Papilla* or *Nipple*, which is of a Cylindrical form, and of a redder colour than the rest of the Integuments of the Breast. It has a delicate Skin, and is extremely sensible.

It is of different sizes in different ages and constitutions, and is always larger in the time of Gestation, or of Nursing.

It is capable of distension from titillation, or when influenced by the Passions.

It is composed of a *tough Cellular*, or *Ligamentous Substance*, which incloses the Lactiferous Tubes, and which is so elastic, that after the part is drawn out or distended, it readily recovers its former dimension, when the cause of distension is removed.

Upon the Apex of the Nipple, the *Orifices* of the Lactiferous Ducts appear, which are of the same number with the Ducts that enter its base.

Around the Nipple, there is a *Circle* or *Disk*, called *Areola*,—nearly of the same colour with that of the Nipple itself.

The colour here, however, varies at different times of life,—being florid in Girls, of a pale brown in Women more advanced in life, and in old age dull and livid.

During Pregnancy, it is of a darker colour than at other times, in consequence of a change which takes place in the Corpus Mucosum which forms it.

Under the Skin of the Areola, there are numerous *Sebaceous Glands*, or *Follicles*, the orifices of which discharge an oily Mucus, to defend the Nipple and Areola around it, and prevent them from being excoriated.

The *Arteries* of the Mamma are partly from the Internal, and partly from the External Mammaries; the former of which are sent off from the Subclavian, and the latter from the Axillary Artery;—the Branches entering the Mamma at different places.

The *Veins* accompany the Arteries, and are distinguished by the same name.

The *Absorbents*, like the Blood-vessels of the Mamma, are numerous. The greater part of them pass through the Axillary Glands; others penetrate the Interstices of the Ribs, near the Sternum, and enter the

Glands which belong to the Internal Mammary Vessels.

The *Nerves* are chiefly from the Axillary Plexus, a few Branches being also sent off from the Intercostals.

From the extremities of the Arteries in the Substance of the Mamma, numberless Tubes arise, called *Ductus* vel *Tubuli Lactiferi.* They gradually unite into Trunks, which run in a radiated manner, and, becoming greatly enlarged in the time of Suckling, serve as Reservoirs in which the Milk is contained.

The Lactiferous Ducts are accompanied, in the Substance of the Mamma, by a *tough white elastic Substance*, which follows them to the Nipple.

At the root of the Nipple they become contracted, and are there from *twelve* to *eighteen* and upwards in number.

Either from the want of uniformity, however, with respect to their number in different Subjects, or from the difficulty of perceiving them, they have been variously estimated by different Authors.

Near the root of the Nipple, they have been supposed by DR MECKEL to form a Circle of communication;—but this has been ascribed, by still later Anatomists, to a laceration of Vessels. Numerous preparations and experiments,—particularly that of throwing in an Injection at one Duct, and finding that it fills only one part of the Mamma, without returning by any other Duct,—seem sufficiently to indicate, that there is no such circular communication.

In the Substance of the Nipple, the Lactiferous Tubes are at a little distance from each other, and are coiled up in such a manner, that the spontaneous flow of the milk is prevented, unless it be accumulated in so large a quantity as to extend them.

But when the Nipple is drawn out and extended,—as by the application of the Child's Mouth,—the Ducts become straight and parallel to each other, so as to allow an uninterrupted flow of Milk.

After Sucking, the Nipple, and consequently its Ducts, immediately recover their former situation.

Sometimes one or more of the Lactiferous Ducts terminate upon the Surface of the Areola, from which MORGAGNI supposed that the Glands there were of the Lactiferous kind.

In Children the Mammæ are merely Cutaneous Tubercles, but at the time of Birth they are large in proportion, and in both Sexes contain a *Milky-like Mucus*, which can be readily squeezed out.

This Fluid commonly disappears a short time after Birth;—but there are various examples on record, where Milk has been brought to the Breasts, both of young Girls and old Women, by the frequent application of a Child to the Nipple, and where there was no cause for suspecting this to be the consequence of Impregnation. Nor are instances wanting of Milk having been brought to the Mammillæ of Men by the same application.

The Mammæ add much to the ornament of the Sex, but serve in particular for furnishing Nourishment to the Child, which is conveyed through the medium of the Nipple.

The secretion of the Milk begins a little before Delivery, but increases more rapidly soon after it; and continues to flow for many months, and even for some years, if the Woman suckle her child; and the more frequently the Milk is extracted, the greater is the quantity received in a given time.

The operation of Sucking depends upon the principles of the Air-pump. The Child embraces the Nipple closely by means of its Lips, which prevents the external Air from entering; then draws the Ducts to a straight line, and prepares a space for the Milk, which is forced from the Breast by the pressure of the atmosphere, and flows to the Mouth in the manner a fluid follows the Piston of a common Pump or Syringe.

Milk varies in its qualities in different Animals. It is considered to be a sort of Emulsion, composed of an oily Concrete or Butter,—a Curd from which Cheese is produced,—and a Serum or Whey, that contains a Saccharine Matter, which keeps the other two Substances in union with its Water. Each of these ingredients is again composed of various others, which have been most attended to in Cow's Milk, from which that of Women differs chiefly in having less Curd, and that so intimately combined with the Oil, as not to yield Butter, and in possessing more Saccharine Substance.

INTERNAL PARTS OF THE THORAX.

The Mammæ and Muscles, covering the fore and lateral parts of the Thorax, being laid aside, and the Ribs afterwards cut from the Sternum and turned back, the *Internal Parts* of the Thorax are brought into view.

They consist of the *Pleura*, which lines the Thorax; —the *Mediastinum*, which divides it into right and left

Cavities, and contains several Vessels, Nerves, &c. between its Layers;—the *Pericardium* and *Heart*, which occupy the middle;—and the *Lungs*, which surround the Heart, and fill the greater part of the Thorax.

PLEURA.

The *Pleura* is a thin Membrane, with some degree of transparency, and of considerable strength, which lines the inner side of the Thorax, and covers most of its contents.

Its External Surface is *Cellular*, and adheres closely to the parts with which it is connected.

Its Internal Surface is *smooth* and *polished*, being moistened by a Serous Fluid, which exudes from its Arteries; hence the Pleura is one of those Membranes called *Serous*.

It is divided into *two lateral Sacs*, or *Pleuræ*, of unequal size, the right being the larger, corresponding with the greater size of the Right Lung, which it covers. The form of the Sacs correspond exactly with that of the surrounding Bones of the Thorax.

The Pleuræ adhere to the Periosteum of the Ribs, line the Inter-costales and Sterno-costales, the Sternum, and Dorsal Vertebræ, and cover the Pericardium, Lungs, and lateral or fleshy parts of the Diaphragm.

They descend at the under part of the Thorax, as far as the Twelfth Pair of Ribs, to which they are attached; and, at the upper end, they rise a little above the first Rib on each side.

Behind the Sternum, the Pleuræ are contiguous to each other, and form the *Partition* called *Mediastinum*, which extends between the Sternum and Vertebræ.

The *Arteries* of the Pleura are from those of the adjacent parts, viz. from the Intercostal, Mammary, Diaphragmatic, Bronchial, and Esophageal Arteries.

The *Veins*, which return the Blood, accompany the Arteries, and are distinguished by the same names.

The *Nerves* are from the Intercostals and Diaphragmatics, but too small to be easily traced; and the Membrane itself is not observed to possess much sensibility in a sound state.

The Pleura by its smoothness facilitates the motions of the Heart and Lungs, divides the Thorax into Cavities, and strengthens its containing and contained parts.

MEDIASTINUM.

The *Mediastinum*, so named from its situation in the middle of the Thorax, extends, as has been already observed, between the Sternum and Vertebræ, but is intercepted by the Heart and root of the Lungs, and divides the Thorax into two distinct Cavities, which have no communication with each other.

It is formed by a reflection of the Pleura, and is of course double, and contains between its Layers a considerable quantity of Cellular Substance, by which they are united.

It is divided into *Anterior* and *Posterior Mediastinum*, the former of which is situated at the fore, and the latter at the back part of the Thorax.

The *Anterior Mediastinum* is connected before to the Sternum, and behind to the Pericardium and large Vessels of the Heart.

The two Layers of the Anterior Mediastinum are closely applied to each other, excepting at the upper part of the Thorax, where they are separated by the remains of the *Thymus Gland.*

At the upper part of the Thorax, it lies exactly behind the middle of the Sternum; but, in its descent, it inclines gradually to the left edge of that Bone, so as to divide the Thorax unequally.

In consequence of its obliquity, a pointed instrument, pushed through the centre of the Sternum, is generally found to pass into the right Cavity of the Thorax.

Frequent deviations, however, from this general rule, have been met with.—In particular, LIEUTAUD and SABATIER relate several instances where the Anterior Mediastinum was found to descend along the middle of the Sternum; and others, though rare, where it descended even to the right side of this Bone.

The *Posterior Mediastinum* reaches from the root of the Lungs and back part of the Heart, to the Dorsal Vertebræ.

Between the Layers of the Posterior Mediastinum, a *Triangular Space* is formed, in which are situated the under end of the Trachea, the Esophagus, the Aorta Descendens, the Vena Azygos, the Thoracic Duct, with some Lymphatic Glands, and the Eighth Pair of Nerves.

The *Blood-vessels* of the Mediastinum are from those of the neighbouring parts:—The Anterior Mediastinum is supplied by Branches from the Subclavian, Internal Mammaries, and Diaphragmatics,—and the Posterior

Mediastinum by Branches from the Intercostals and Esophageals.

The *Veins* accompany the Arteries, and have the same names.

The Mediastinum divides the Thorax into two Cavities, supports its general Contents, keeps one Lung from pressing upon the other when a Person lies on his side, and prevents Fluids, which, in consequence of accidents or disease, may be contained in the Cavity of the Thorax, from passing from one side to the other.

PERICARDIUM.

The *Pericardium*, *Sac*, or *Capsule* of the Heart, is one of the strongest Membranes of the Body, and its size such as to be properly adapted to that of the Heart, which it contains.

It is formed of *two Layers;* the *External* of which is a continuation of that part of the Pleura which forms the Anterior Mediastinum, and which afterwards passes over the Lungs and lateral parts of the Diaphragm.

The *Internal Layer* is smooth, tendinous-like, and has Fibres running in different directions, something like those of the Dura Mater. It is polished on its inner Surface, and is stronger than the External.

The Pericardium adheres so firmly to the Tendinous and left side of the Fleshy part of the Diaphragm, as not to be separated from it without much difficulty.

It extends a considerable way beyond the Base of the Heart, and includes the large Blood-vessels as far as the roots of the first principal Branches, in consequence of which it forms several angles, which have been termed *Cornua* of the Pericardium.

While the External Layer is reflected to cover the parts which surround it, the Internal is also reflected, first over the roots of the large Blood-vessels, and then over the Heart, to form the proper covering of that Organ; in the same manner as the Tunica Conjunctiva is reflected from the Eye-lids to cover the fore part of the Eye; or, strictly speaking, the Heart lies behind, or on the outside of the Pericardium.

From the ends of the Extreme Arteries upon its Surface, a Fluid, called *Liquor Pericardii*, is discharged, by which it is lubricated, and the effects of friction diminished.

The Liquor Pericardii is commonly found, after death, in the quantity of a few Drachms, though not unfrequently of one or two Ounces.

According to the experiments of DR BOSTOCK, it is composed of Water, with a small proportion of Albumen, Mucus, and Muriate of Soda.

It is redder in a young Subject than in a Person advanced in life, in whom it becomes paler, or more of a straw colour.

The *Arteries* of the fore part of the Pericardium are from the Internal Mammaries and Diaphragmatics; those of its back part from the Bronchials and Esophageals.

The *Veins* correspond with the Arteries, and have the same names.

The *Nerves* of this Membrane are not obvious to the Senses.

The Pericardium preserves the Heart *in situ;* prevents it from pressing upon the Lungs; defends it from being injured by these, or by other parts that surround it; and admit of its ordinary, but restrains its inordinate motions.

HEART.

The *Heart* is a hollow Muscle, varying a little in size in different Persons independent of the bulk of the Body, but is generally about a pound in weight. It is divided into different Cavities, and is inclosed in the Pericardium.

It is situated in the Cavity of the Thorax, behind the Sternum and Cartilages of the true Ribs, and between the right and left Lungs.

It is of a *Conical* figure, but flattened at one side, and is divided into *Base*, *Body*, and *Apex*, with a *Superior* and *Inferior Surface*, and a *Right* and *Left Margin*, the whole being commonly about five inches in length.

The Base is placed backwards next the Spine, while the Body and Apex are turned forwards, and obliquely over to the left side.

In Quadrupeds the Heart is placed upon a line with the Sternum; the point of it being the only part which touches the Diaphragm.—In the Human Body, the Apex is but a little lower than the Base, and projects between the two Lobes of the Left Lung, behind the Cartilages of the Fifth and Sixth True Ribs of that Side, or a little below the left Nipple. Here the Pulsation may be felt in a living Person, in consequence of the Apex of the Heart being elevated and thrust forward during the dilatation of the Base of this Organ, and contraction of its Body. The situation, however, varies in a small degree, according to the position of the Thorax, and state of Respiration.

Though this be the common situation of the Heart, a few rare and singular instances have occurred, where it has been found to occupy the right side of the Thorax; and a displacement has sometimes happened, in consequence of different kinds of Tumours occurring in the left side of this Cavity.

The *Superior* or *Anterior Surface* of the Heart is convex, and is opposed to the posterior Surface of the Sternum and Cartilages of the Ribs; the anterior edges of the Lungs intervening.

The *Inferior* or *Posterior Surface* is flat, and rests upon the Tendon of the Diaphragm which supports it. The Heart is not much affected, however, by the motions of that Muscle in time of respiration; its Tendon moving only in a small degree.

The Apex Cordis lies directly behind the Cartilages of the Ribs, the Left Lung not intervening, but forming at this place a curve about the Heart.

The right side of the Body of the Heart is thin and sharp, and is called, by DR HALLER, *Margo Acutus.*

The left side is thick and round, and is termed, by the same Author, *Margo Obtusus.*

The Base is formed of a Right and Left *Auricle,* and the Body of a Right and Left *Ventricle.*

The Apex is commonly formed by the Left Ventricle, but sometimes there are two Apices, one belonging to each Ventricle.

When all the Cavities of the Heart are distended, the Right Auricle, and part of the corresponding Ventricle, project into the right, and the rest of the Heart into the left Cavity of the Thorax.

The Heart is connected above and behind to the upper and back part of the Thorax, through the Medium of the *great Vessels* which go into, or pass out from it.

The other parts of the Heart are free, being merely contiguous to the inside of the Pericardium.

The External Surface of the Heart is covered by a thin, smooth, Serous Membrane, which is a reflection of the inner Layer of the Pericardium, and which gives additional strength to its Fleshy Fibres.

Between this Coat and the Substance of the Heart, there is commonly a considerable quantity of *Fat*, which lubricates it, and facilitates its motions.

In the interstices of the Fat, the Heart has somewhat of a pink appearance, interspersed with whitish lines, formed by the Branches of Blood-vessels and Nerves.

The Fat is chiefly placed in the Grooves between the Auricles and Ventricles, in the Furrows which distinguish the Ventricles from each other, and along the principal Ramifications of the Blood-vessels; the Auricles are, for the most part, destitute of Fat.

The Substance of the Heart consists of what is called the *Muscular Coat* of the *Heart;* here the *Fibres* are smaller but firmer, and more closely connected than the Fibres of Muscles generally are in the other parts of the Body.

The Fibres of the Heart run in different directions, longitudinally and transversely, but most of them obliquely.

Many of them run over the point of the Heart from one Surface to the other, and the whole are so much twisted and folded, and so variously intermixed, as to render it difficult to unravel or describe them.—In general, however, their course is such as to lessen the Cavities of the Heart in all their dimensions.

The *Cavities* of the Heart are lined by a Membrane extremely thin, but dense and strong, to defend it against the pressure of the Blood, and to prevent the latter from insinuating itself between the Muscular Fibres of this Viscus. No Blood-vessels, Absorbents, nor Nerves, have yet been traced in this Membrane.

The Heart is formed of an *Anterior* or *Right*, and a *Posterior* or *Left* side, or of a *Right* and a *Left Heart*, joined together by a *Partition*, which prevents the two sides from having any direct communication with each other.—The terms Right and Left are, strictly speaking, more applicable to the Heart of Quadrupeds, and those of Anterior and Posterior to that of the Human Body; but as the Heart is placed obliquely, the Anterior Auricle and Ventricle are turned more to the right than the Posterior are, therefore the common terms of *Right* and *Left* may be still applied with propriety.

The Right Heart belongs to the Lungs, and has, therefore, also the name of *Pulmonic* or *Pulmonary*; and the Left Heart to the rest of the Body, and is on that account called *Systematic*, and sometimes *Aortic*. Between the two Hearts there is a Furrow which marks the line of distinction externally.

Each side of the Heart is furnished with a set of *Veins*, with an *Auricle*, a *Ventricle*, and an *Artery*, and also with two Sets of Valves, one of which is situated between the Auricle and Ventricle, the other between the Ventricle and Artery.

At the right side of the Heart are two Veins, called from their large size *Venæ Cavæ;* the one *Superior,* the other *Inferior.*

The *Superior Vena Cava,* called also *Vena Cava Descendens,* conveys the Blood from the upper part of the Body; and the *Inferior Vena Cava,* termed likewise *Ascendens,* conveys it from the lower parts; and both terminate in the Right Auricle; the Superior Cava entering at the fore, upper, and right side, and the Inferior Cava at the back, under, and right side of that Cavity. The Blood in the Auricle is prevented from returning by the fulness of the Veins, and by the pressure of the Blood *a tergo.*

The *Auricle* is situated upon the right, and partly upon the back part of the Heart. It is somewhat of an oval form, and is divided into the *Right Sinus Venosus,* and *Proper Auricle.*

The *Sinus Venosus,* vel *Sinus Venarum Cavarum,* is formed by the union of the two Venæ Cavæ, which swell out towards the anterior and left side. It is notched at its anterior edge, is thin when compared with the corresponding Ventricle, being only about the eighth part of an inch in thickness; but is a Muscular Bag of considerable strength, and, both upon its outer and inner Surface, is uniform and smooth.

At the upper and left side of the Sinus, and to the left of the Superior Cava, is the projection or Appendix, termed, from its supposed resemblance to the Ear of a Quadruped, *Proper Auricle.* It is formed by a blind Sac, which is serrated and notched on its posterior edge, convex or rounded anteriorly, and terminates obliquely in an obtuse point, which turns backwards and to the right side.

The Sinus and Proper Auricle form one common Cavity, have no Valve between them, and are therefore filled and emptied at the same time.

Where the two Cavæ meet in the Hearts of Quadrupeds, there is a *Projection* in the Sinus Venosus, called *Tuberculum* LOWERI, which is supposed to prevent the Blood of the one Cava from rushing upon that of the other, and to direct it into the Auricle.

At the meeting of the two Cavæ in the Human Heart, an Angle is formed, which also has frequently got the name of *Tuberculum* LOWERI.—This term, however, is more properly applied to the Projection in the Hearts of Brute Animals.

Under this Angle or joining of the Venæ Cavæ, there is a superficial Depression, about the size of the point of the Finger, which is the Vestige of the *Foramen Ovale*. This, in a Fœtus, forms a communication between the Right and Left Auricles, but in an Adult, is occupied by the original Valve, which now assists in forming the *Fossa Ovalis*.

The Foramen Ovale is generally completely shut in an Adult, but sometimes a small aperture remains, at the upper part of the oval Fossa, and this has been more frequently detected in Female than in Male Subjects.

The Fossa Ovalis has thick and strong edges, at its upper and fore part, called *Columnæ Foraminis Ovalis*, *Isthmus* VIEUSSENII, vel *Annulus Fossæ Ovalis*.

At the left side of the Mouth of the Inferior Cava, where it joins the Sinus Venosus, is the *Valve of* EUSTACHIUS, which is formed by the inner Coats of the Cava and Sinus.

The Valve is in the shape of a crescent, with the convex edge fixed to the union of the Sinus and Cava, and the concave edge turned obliquely upwards, and reaching about half way over the Mouth of the Cava. Its size and appearance, however, vary much in different subjects, being sometimes half an inch in breadth, at other times scarcely a vestige of it is to be seen.

Its posterior Cornu is continued with the left side of the Isthmus of the Fossa Ovalis, the other end vanishes in the right side of the Sinus.

It is equally distinct in an Adult as in a Fœtus; but in the former it is frequently found reticulated, or Cribriform, which appearance is seldom, though sometimes, met with in the latter. In a recent case, the Author found this Valve perfectly Cribriform in a child that died a few hours after Birth.

In an Adult, it is supposed to prevent the Blood of the Auricle from passing into the inferior Cava; and in a Fœtus, to direct the Blood of the Inferior Cava to the Foramen Ovale.

Upon the left side of the Valve of EUSTACHIUS, in the under and back part of the Auricle, is the *Orifice* or *Termination* of the Coronary Vein of the Heart.

Over and towards the right side of the Orifice of this Vein, there is a semilunar Valve to prevent the Blood in the Auricle from passing into the Vein. This, like the EUSTACHIAN Valve, varies much in appearance.

The inner side of the proper Auricle is readily distinguished from the Sinus, by having a number of *Fleshy*

Pillars in it, which, from their supposed resemblance to the Teeth of a Comb, sometimes obtain the name of *Musculi Auriculæ Pectinati.*

The Musculi Pectinati have smaller columns running in different directions, giving the whole a reticulated appearance.

Between the Fleshy Pillars are *Depressions*, or *Furrows*, where the sides of the Auricle are thin, and semi-transparent, being here chiefly formed of the outer and inner Membranes only.

The Right Auricle receives the Blood from the Venæ Cavæ and Coronary Veins, and, by its Muscular contraction, discharges it into the corresponding Ventricle, out of which it is prevented from returning by the *Tricuspid* Valve, placed within the Ventricle.

At the under and left side of the Sinus Venosus, and opposite to a *Groove* situated externally between the Auricle and Ventricle, there is a *Circular Hole*, above an inch and a half in diameter, which opens into the upper and right part of the corresponding Ventricle, and is termed Auricular Orifice of the Ventricle.

The *Right* or *Pulmonary Ventricle* is situated on the fore side of the Heart, the Base and Apex corresponding to those of the Heart; in general this is of a triangular form externally, and is about the sixth part of an inch in thickness, and of course stronger than the corresponding Auricle, which has merely to send the Blood to the Ventricle.

It has internally, but more especially towards the Apex Cordis, many strong Eminences, Columns, Lacertuli, or Cords, called *Columnæ Carneæ.*

The *Columnæ* run in different directions, but the strongest of them longitudinally with respect to the Ventricle; and are of various sizes, forming so many distinct Muscles, which are extremely compact in their structure, and compose a beautiful, intricate, and irregular net-work, that varies in appearance almost in every subject.

In general, they adhere through their whole length to each other, or to the sides of the Ventricle, but many of them are loose in their middle, and may be raised by a Probe put under them.

They assist the Ventricle, in its *Systole* or contraction, render it stronger, prevent it from being overstretched in its *Diastole* or dilatation, and agitate the Blood in its passage through the Ventricle, so as to mix its different parts freely together, and prevent Coagulation.

They are supposed to bring the opposite sides of the Ventricle completely together, during its contraction.

The Columnæ intersect each other in different directions, and inclose many deep *Grooves*, *Pits*, or *Foveæ*, in the bottom of which there are still smaller Cavities. Into all of these the Blood readily enters.

Around the Auricular Orifice of the Ventricle, there is a *Tendinous Margin* or *Ring*, from the whole edge of which a circular Membrane is sent off, called *Valvula Tricuspis*, vel *Triglochin*, from its having three principal but unequal points or divisions, though there are others, but they are less considerable. This is white, semi-transparent, and thin, but of great toughness and strength, and lies contiguous to the sides of the Ventricle.

From the whole edge of the Valve, next the point of the Heart, small round *Tendinous Cords* are sent off, which uniting, form a number of Cords of an unequal size.

The *Chordæ Tendineæ* descend obliquely within the Ventricle in the same direction with the Valve from which they arise.

They are fixed to the extremities of a few strong *Columnæ Carneæ*, termed here also *Musculi Papillares*, which are joined by their other ends to the corresponding sides of the Ventricle; the anterior and largest being on the fore part, and the other two on the posterior and inferior sides of that Cavity. Besides the three principal portions of the Valve, it has some Tendinous Cords, and Fleshy Pillars of inferior size, fixed in the same manner with the rest.

The Tricuspid Valve prevents the reflux of the Blood to the Auricle, during the contraction of the Ventricle, the Blood at this time insinuating itself between the Walls of the latter and the Valve.

The Tendinous Cords are of such a length as to allow the Valve to be laid against the sides of the Ventricle, in the distended state of this Organ, but admit it to be pushed back by the Blood, until a complete Septum or Partition is formed at the Mouth of the Ventricle, during the contraction of the latter.—The Papillæ, by their contraction, prevent the Valve from being pushed into the Auricle.

The Valve is opened, and pressed back against the sides of the Ventricle, by the Blood, in its passage from the Auricle.

The upper and left side of the Ventricle becomes smooth and uniform, and leads to a large Opening about an inch in diameter, and of a firm callous nature, which is the mouth of the Pulmonary Artery. This is termed the *Auricular Orifice* of the Ventricle.

The Right Ventricle, by its dilatation, receives the Blood from the Auricle, and sends it, by a strong, sudden, and convulsive contraction, to the Pulmonary Artery, from whence it is prevented from returning by three Valves placed in the Mouth of that Artery.

The Valves at the Mouth of the Pulmonary Artery are called *Valvulæ Semilunares*, vel *Sigmoïdeæ*, from the resemblance of their edges to those of a crescent. Two of them are placed in the fore, and one in the back part of the Artery.

Each of them is turned upwards, so as to form a *small Sac*, one edge of which adheres to a third part of the circumference of the inside of the Artery; the other edge is loose in the Cavity of that Vessel; and is somewhat thicker and stronger than the rest of the Valve—the thickened edge serving it as a Ligament.

The loose edge has a *general Curve*, divided into *two smaller ones*, which meet in a *point* at the middle.

The Valves are chiefly formed of a doubling or extension of the inner Coat of the Artery.

In the middle point, or loose edge of each of the Valves, there is a small hard *Triangular Granula*, of a somewhat redder colour than the rest of the Valve, called, from its reputed Discoverers, *Corpusculum* ARANTII, vel *Corpusculum* MORGAGNI; or, from its resemblance in shape to the Seed of the Sesamum, *Corpusculum Sesamoideum.*

The Corpuscles complete the Valves at the centre or Axis of the Artery, and enable them to make a stronger resistance against the Blood, while the Artery is in action.

The Semilunar Valves, when shut, are *concave* towards the Artery, *convex* towards the Ventricle, and have their loose edges opposed to each other, so as to enable them to form a complete *Partition* between the Ventricle and Artery.

Opposite to the Semilunar Valve, the Artery bulges out, and forms *Three Projections*, which have corresponding Pits or Depressions within, and are called, from their Discoverer, *Sinus* VALSALVÆ.

The *Sinuses* of VALSALVA are of the same nature with those Dilatations which are found in the Veins and Lymphatics, between their sides and Valves; and, like them, are partly formed by the pressure of the Fluids upon the sides of the Vessels.

The Pulmonary Artery receives the Blood from the Right Ventricle, and, by its contractile power, assists the Ventricle in driving it through the Lungs.

The Semilunar Valves, pressed back by the Blood in the Artery, prevent its return into the Ventricle.

The Valves are opened again in consequence of their being driven towards the sides of the Artery by the current of the Blood, upon the next contraction or stroke of the Ventricle.

The Pulmonary Artery passes behind the Sternum, and separates into *Right* and *Left Branches*, which go to the corresponding parts of the Lungs.

The two Branches of the Pulmonary Artery, like those of the Arteries of the Viscera in other parts of the large Cavities, suddenly divide into still smaller Branches.

From the extreme Arteries of the Lungs, corresponding Veins arise, which are merely the continuation or reflection of the Arteries, without any intermediate Cells or dilatations.

The Pulmonary Veins, in the Substance of the Lungs, gradually unite, and form *Four Principal Trunks*, which terminate in, and carry the Blood to, the left Auricle.

Of the Pulmonary Veins, *two* come from the right, and *two* likewise from the left Lung, which are somewhat smaller than those from the right; and the whole terminate in the corresponding sides of the left Auricle, towards its upper and back part.

The *Left Auricle* is considerably thicker and stronger than the Right, and is also divided into Sinus Venosus and Proper Auricle, which form one Common Cavity, without the intervention of any Valve.

The *Left Sinus Venosus*, called also *Sinus Pulmonalis*, is turned towards the Spine, is more of a cubical form than the Right one, but resembles it in the uniformity and smoothness of its outer and inner Surfaces, also in its Colour, which is paler than that of the Ventricles.

From the fore and left part of the Sinus, the *Proper Auricle* projects, and forms a distinct flat *Appendix* or *Bag*, which is twisted, has different Curvatures or Indentations upon its edges, and points forwards, and to the left side.

The inner part of the Proper Auricle is *longer*, but *narrower*, than that on the right side; like it, however, it is formed of Columnæ, with Furrows between them, but these less distinct than those in the other Auricle.

The Proper Auricle is somewhat less capacious than that on the right side; but the Sinus is so much larger as to render the two common Cavities of the right and left Auricles nearly equal.

The two Auricles have a slight Groove between them externally, and a thin *Fleshy Septum* within, formed by their opposite sides, in which, as has been already mentioned, there is a *Foramen Ovale* in a Fœtus;—but in an Adult the Partition is generally perfect, leaving merely the vestige of the Valve which belonged to this Passage, and which is distinguished from the rest of the Septum, by its greater degree of transparency, being only about the thickness of a wafer.

From the under part of the Sinus Venosus, a *Circular Passage*, termed *Auricular Orifice* of this Ventricle, leads down to the posterior part of the base of the Cavity of the Left Ventricle. This is opposite to a *Groove* seen externally between the Auricle and Ventricle, and is about the same size with that of the right Auricular Orifice.

The Left Auricle receives the Blood from the Pulmonary Veins, and, by its Muscular contraction, drives it to the Left Ventricle, out of which it is prevented from returning, by a Valve in the Ventricle, called *Mitralis.*

The *Left* or *Aortic Ventricle* is situated in the posterior and left part of the Heart, and is somewhat of an egg shape.

Its sides are about *three times thicker* and *stronger* than those of the Right Ventricle; the thickness being in proportion to the force required to propel the Blood to the most remote parts of the Body.

It is *narrower* and *rounder*, but considerably *longer*, both on its External Surface and in its Internal Cavity, than the Right Ventricle, and generally descends some way below the other, and forms the Apex Cordis.

The Cavity is commonly described as being less than that of the Right Ventricle;—but the apparent difference, which takes place after death, is accounted for with seeming propriety by some Authors,—from the Left Ventricle being then for the most part found empty, and the Right one full, and from the greater degree of contractility in the former.

That the capacity of the Cavities of the right and left sides of the Heart is more nearly equal during life than after death, or than it is generally supposed to be, is evident from the appearance of the Heart of the Human and also of the Brute kind, and from Injections thrown into the two sides of the Heart, where the force applied is in proportion to the relative strength of each side.

The size of the Cavities of the Heart, varies in different persons. In general, each is found to contain between two and three Ounces of Water, when moderately distended.

The inner Surface of the Left Ventricle has the same general appearance with the Ventricle of the right side, but differs from it in having its Columnæ Carneæ larger and greater in number, firmer and stronger; more detached, and more varied in their directions. They form Meshes in the shape of Lozenges, in which are Columnæ of a more slender nature, intercepting Meshes of an inferior size; the last of which appearing to be deeper here than in the Right Ventricle.

In the Passage of communication between the Auricle and Ventricle, there is a *Ring*, from which a *Circular Valve* goes off, with all its Apparatus similar to that between the Right Auricle and Ventricle, and differing in no respect from it in structure and use, except in being stronger, and divided into two principal Portions only; and in the Chordæ Tendineæ being stronger and more numerous.

This Valve has been supposed to bear some resemblance to a *Bishop's Mitre*, from which it has been called *Valvula Mitralis*.

One of the Portions of this Valve is larger than the other, lies over the Mouth of the Aorta, and is supposed to cover it while the Blood is flowing into the Ventricle. The other is contiguous to the opposite side of the Ventricle.

The *Valvula Mitralis* prevents the reflux of the Blood during the contraction of the Ventricle.

After the contraction is over, the Valve returns to its former situation, by the impulse of a fresh current of Blood from the Auricle.

Between the Right and Left Ventricle, there is a thick, strong, impervious *Partition*, which forms a share of the general Septum Cordis, having Columnæ Carneæ upon it, similar to those upon the other parts of the Ventricles. It is composed partly by the Wall of the Right, but chiefly by that of the Left Ventricle; the Right being united to the Left, almost in the form of an Appendix; but the Fibres of the two Ventricles intermix in such a manner as to render the Septum somewhat thicker and stronger than the other parts of the Heart.

This Partition prevents any direct communication between the two Ventricles.

Opposite to the outer edge of the Septum, both upon the upper and under Surfaces of the Heart, there is a *Groove*, which distinguishes the two Ventricles from each other, and in which some of the principal Trunks of the Coronary Vessels are situated.

At the fore and right side of the Valvula Mitralis, and behind the beginning of the Pulmonary Artery, there is a *Round Opening*, which is the Mouth of the Aorta, and which is nearly of the same size with that of the Pulmonary Artery.

Under this opening, the Surface of the Ventricle becomes *smooth* and *equal*, having none of the Columnæ Carneæ, which are seen on the other parts of the sides of its Cavity.

The Left Ventricle receives the Blood sent to it from the Auricle, and, by a contraction similar to, but much stronger than that of the Right Ventricle, propels it to the Aorta.

At the Mouth of the Aorta, there are *three Semilunar Valves*, with their *Corpuscula* ARANTII, perfectly similar to those of the Pulmonary Artery,—but somewhat stronger.

On the outside of the Semilunar Valves, are the *Sinuses* of VALSALVA, resembling those of the Pulmonary Artery,—but a little more prominent.

The Semilunar Valves are pressed back by the Blood, the reflux of which they prevent during the contraction of the Aorta.—They are returned towards the sides of the Aorta, in the same manner, and from the same cause, as those in the Pulmonary Artery.

The *Aorta* passes upwards from the top of the Left Ventricle, and is situated first behind, and then on the right side of the Pulmonary Artery, and between it and the Superior Cava.

It bears nearly the same proportion in thickness and strength to the Pulmonary Artery, which the sides of the Left Ventricle do to those of the Right.

Where the Aorta is about to send off the first of its large Branches at the top of the Thorax, it is of great size, and is sometimes called the *Large Sinus* of VALSALVA.

The Aorta receives the Blood from the Left Ventricle, and, by its Muscular contraction, re-acts upon it, and assists the Ventricle in sending it by numberless Branches through the different parts of the Body, from whence it is returned by the Veins to the Right Auricle.

Besides the Blood-vessels already taken notice of, and which are common to the Heart and the rest of the Body, the Heart is furnished with Vessels peculiar to itself, termed *Cardiac* or *Coronary*, from a *Corona* which they form upon its Surface.

The *Coronary Vessels* consist of two Arteries, a right and left, and one principal Vein.

The *Coronary Arteries*, which are about the size of Crow-quills, arise from the Sinuses of the Mouth of the Aorta, opposite to two of the Semilunar Valves.

One runs in a Groove between the right Auricle and Ventricle, and supplies chiefly the right side of the Heart.

The other passes partly between the Left Auricle and Ventricle, and partly in the Groove between the Ventricles on the fore side of the Heart,—supplying the left side of that Organ, and communicating with the Branches of the other Artery on its upper and under Surfaces.

The Coronary Arteries run under the Serous Membrane, and are entirely dispersed upon the Substance of the Heart, and upon the roots of the great Vessels, forming upon these some of the minute Branches, termed *Vasa Vasorum.*

The Coronary Arteries, from their situation opposite to the Valves, have been supposed to be filled at a different time from that of the rest of the Arterious System; —but from Experiment, it seems now sufficiently ascertained, that the Coronary Vessels have their Pulsation at the same instant with the other Arteries.

The *Coronary Veins* return the Blood from their corresponding Arteries. The principal part of them join into a Trunk, called the *Great Coronary Vein,* which is short, but about the third of an inch in diameter. This, after making a turn from the left side, and running between the Left Auricle and Ventricle, terminates in the under and back part of the Right Auricle, and is there covered by its Valve.

Other Coronary Veins, much smaller than the former, terminate in different parts of the right side of the Heart.

Besides the termination of the Coronary Vessels, as mentioned above, some have taken notice of Branches of these, both Arteries and Veins, as terminating directly in the Cavity of the right side of the Heart, by minute Orifices, which have been termed, after their original describer, *Foramina* THEBESII; but penetrating Injections, thrown into these Vessels, do not appear to detect any such terminations.

The *Absorbents* of the Heart go to the neighbouring Lymphatic Glands.

The *Nerves* are from the Great Sympathetics and Eighth Pair.

With regard to the Circulation of the Blood in general:—The Veins, by a slow and equal motion, and without Pulsation, return the Blood from the different parts of the Body to the Auricles, which serve as Reservoirs of this Fluid. Immediately after receiving it, the Auricles, on account of the quantity and stimulating quality of the Blood, contract suddenly, and at the same time, and send it to the Ventricles, which, having discharged their Contents, are ready to receive it: Its reflux is prevented by means of the Valves.

The Ventricles, from the same cause which stimulates the Auricles, and on account of the stroke the former receive from the latter, contract convulsively, with a force proportioned to the thickness of their sides; and, like a forcing Machine, send the Blood to the Pulmonary Artery and Aorta, or Arterious System in general, which, in dilating to receive it, have a pulsatory motion: Its reflux is prevented by the Semilunar Valves. During the contraction of the Ventricles, these are thrown, by the dilating Auricles and Arch of the Aorta, against the Ribs, where the Stroke occasioned by the Pulse of the Heart may be felt.

The Arteries, by their contractile power and elasticity, send the Blood suddenly to the Veins, through which, by the united force of the Ventricles and Arteries, called the *Vis a tergo*, by the pressure of the surrounding parts, by the pulsation of the adjacent Arteries, by the weight of the Column of Blood in the Veins in certain parts of the Body, and, as some suppose, by a contractile power in the Veins themselves, it is driven again to the Auricles.

In its course, the Blood performs a double circulation,—one called the *Lesser*, the *Pulmonary*, or that through the Lungs,—the other called the *Greater*, the *Aortic* or *Systematic*, or that through the rest of the Body.

In the former, it passes from the Right Ventricle to the Lungs, and returns to the Left Auricle.—In the latter, it goes from the Left Ventricle to the different parts of the Body, and returns to the Right Auricle.

During this Circulation, the Auricles and Ventricles contract and dilate in succession, but the Auricles and Arteries, and the Ventricles and Veins, act in concert with each other.

The Heart is the centre of the Vascular System, and the principal agent in the Circulation of the Blood.

The right side of the Heart receives the Blood, which is contaminated in passing through the Body, and sends it to the Lungs, where it is purified through the medium of the Air.

From the Lungs the Blood, now purified, is returned to the left side of the Heart, to be circulated through all the other parts of the Body, thereby imparting nourishment, growth, and strength, to the general System; being found also to be the source of Sensibility, Irritability, Motion, and Animal Heat.

The Circulation of the Blood is demonstrated by throwing a Ligature round an Artery and its corresponding Vein. The part of the Artery on the side of the Ligature next the Heart then swells, while that on the other side of the Ligature becomes collapsed. The reverse of these circumstances takes place in the Veins, the Blood being now interrupted in its course. The Circulation is also shewn by the aid of a Microscope, in the Blood-vessels of transparent parts of small Animals, as the Foot of a Frog. In the dead Body, by Injections thrown into the Arteries, it can be made to return by the Veins.

CONSTITUENT PARTS OF THE BLOOD.

The Blood has a saponaceous feel, a saline taste, and a peculiar smell. When circulating through the Body, if it be exposed to a Microscope, it has the appearance of Globules diffused through a liquid.

The Blood, when drawn from an Artery, is of a bright red; when taken from a Vein, it is of a deep purple colour; but when the Venous Blood is exposed to the Air, it assumes the colour of Arterious Blood. It becomes florid upon exposure to Oxygen, and is darkened by the noxious Gases.

When taken from the Body, and allowed for some time to remain at rest, it coagulates into a Mass of the consistence of curdled Milk. This separates into a thin fluid, called *Serum*, and a Coagulum termed *Clot*, *Cruor*, or *Crassamentum*, of which there is commonly about three parts of the latter to one of the former, but the proportions vary much in different Animals, and in the same Animal placed under different circumstances.

The Serum is a little heavier than Water, and of a yellowish-green colour. When slightly heated it coagulates, owing to the presence of Albumen. From the Coagulum a thin turbid Fluid can be separated, which is called *Serosity*. This contains Water, with a small proportion of Albumen, and different Saline Substances. Gelatin was also considered as a constituent of the Serum, but late experiments show that this opinion is not well founded.

The Clot is of a dark red colour, but acquires a more florid hue on exposure to the Air. When put into a Bag, and washed with Water, it is separated into two parts, the red Globules, which the Water retains, and a Substance termed *Gluten*, *Coagulable Lymph*, or *Fibrin*, which is of a white colour, and an elastic Fibrous nature, and which forms the Buffy Coat seen on the surface of the Blood of a Person labouring under Inflammation. BERZELIUS and BRANDE have shewn that the Clot is a compound of Fibrin, Albumen, and Colouring Matter of the Blood.

From late experiments, it appears that the colouring Particles contain Iron, with some Saline Matter, the former of which is supposed by some to be the cause of the red colour of the Blood, while others assert that the colouring Matter is an Animal Substance of a peculiar nature.

LUNGS.

The *Lungs* are two soft spongy Bodies, which occupy the greater part of the Cavity of the Thorax.

They completely fill the two Bags of the Pleura, and are every where in contact with the parts adjacent;

no Air intervening between them and the Thorax, till an opening is made into the Cavity of the latter, when they instantly collapse.

In *Figure* they are somewhat Conical, or they have been compared to that of the Foot of an Ox, with the back part turned forwards, and this figure they retain, whether in their dilated or collapsed state;—or their shape corresponds exactly with the inside of the Thorax, being rounded next the Ribs, hollow towards the Diaphragm, and irregularly flattened and depressed next the Mediastinum and Heart.

The *Colour* of the Lungs has been said by some to vary in different parts of this Organ, and to be deepest below, on account of the greater quantity of Blood there; but this deeper tinge, occasionally seen in the lowest part, is chiefly owing to the Blood, from its own gravity, falling to the most dependent part of the Lungs after death.

They are of a reddish or pink colour in Children, of a light blue or greyish colour in Adults, and more of a purple or livid colour in old age, at which period they are also observed to be tinged with black spots, proceeding from a matter secreted in their Substance.

They are joined to the Neck by the Trachea; to the Spine by the two Layers of the posterior Mediastinum, which serve them as Ligaments; and to the Heart by the Pulmonary Vessels; the rest of them being free and unconnected, unless when an adhesion takes place in consequence of inflammation.

They are divided into *Right* and *Left Portions*, or *Lungs*, which are independent of each other, a separation being made between them by the Heart and Mediastinum, and which have no communication, except through the medium of the Trachea, in consequence of which Respiration is sometimes continued for a considerable time, where one of the Lungs is almost entirely consumed.

Each of the Lungs is again divided by Fissures, varying in depth in different Bodies, into large Portions, called *Lobes*, which facilitates their motion, and the dilatation of their Cells.

Of the Lobes, *three* belong to the Right Lung, corresponding with the larger Bag of the Pleura, and *two* to the Left, between which there is a Notch or Sinus, occupied by the point of the Heart. Sometimes an *additional Lobe* is found in the Left Lung, or the reverse in the Right one; but mistakes may arise in numbering these, in consequence of morbid adhesions.

Each of the Lobes is subdivided into many smaller parts, termed *Lobules*, which are of different sizes, and of an irregular angular form.

The Lobules are also subdivided, and they degenerate at last into small *Vesicles* or *Cells*, which constitute a large share of the Lungs.

The Cells of the Lungs are purely Membranous, of an irregular figure, but all nearly of the same size, compressed and closely connected, and have a free communication with each other.

Between the different Lobes, Lobules, and Cells, a large quantity of common Cellular Substance, destitute of Fat, is interposed, which unites and strengthens them, and allows the Blood-vessels to be minutely dispersed over them.

The Cells of the Lungs have no communication with this Common Cellular Substance, for when Air is blown into it, the Lobules are compressed; but when the Air is blown in through a Branch of the Trachea, the Cells are again distended, and the Lobules recover their former dimensions.

In a Fœtus, the Cells are empty and in a collapsed state;—but as soon as Respiration begins, they become distended, and continue so during life, and in every state of Respiration, and even in the recently dead Body:—But if an opening be made into the Cavity of the Thorax, whether in a living or dead Body, and the Air in this or in any other way freely admitted, they immediately collapse by their *weight* and *elasticity*, the pressure of the Air being then the same on the outer Surface of the Lungs, and inner Surface of the Trachea.

The Lungs are covered by *two Coats*, an External or Common, and an Internal or Proper one.

The *External* or *Common Coat* is a continuation or reflection of the Pleura, is extremely thin, but dense, and, like the other Parts of the Pleura, is found to possess little Sensibility. It forms a general covering to the Lungs, but does not enter between their different Lobules.

The *Internal Proper Coat* adheres so firmly to the former, as to appear, in an Adult, to constitute part of its Substance, but, in a young Subject, may be readily separated from it. It not only covers the Lungs, but insinuates itself between their Lobes and Lobules, and is intimately connected with their Cellular Substance.

Besides the Cells, various kinds of Vessels, viz. the *Vessels* or *Branches of the Trachea*, *Blood-vessels*, and

Absorbents, together with small branches of *Nerves*, enter into the composition of the Lungs.

TRACHEA.

The *Trachea*, vel *Aspera Arteria*, so called from the inequality of its Surface, and from its conveying Air, is a Cartilago-Membranous Tube, which begins at the under part of the Cricoid Cartilage, and descends in the fore part of the Neck, covered at first by the Thyroid Gland and Sterno-hyoidei, and afterwards by the Skin and Cellular Substance only. Its lateral parts are concealed by the Sterno-hyoidei and Sterno-thyroidei.

From the Neck, it passes into the Thorax, where it is situated between the Layers of the upper part of the Posterior Mediastinum.

Behind the Curvature of the Aorta, and opposite to the Third Dorsal Vertebra, the Trachea divides into two lateral Branches, termed *Bronchi*, one of which goes directly to the Right, and the other, which is the longer, but rather the smaller of the two, passes under the Arch of the Aorta to the Left Lung.

Each of the Bronchi is subdivided at the place where it enters the Lung, the Right separating into three principal Branches, the Left often only into two. In the Substance of the Lungs, the Bronchial Branches are every where distributed, each Branch running between a corresponding Ramification of an Artery and Vein. They divide and subdivide after the manner of the branching of a Tree.

They become smaller and smaller, till at length they form an infinite number of Capillary Tubes, which, dilating at their extremities, terminate in the *Cells* of the Lungs.

The Cells of the Lungs, in a Child, are barely visible to the naked Eye. In an Adult they are larger, and in both they communicate so freely together, that upon introducing Air into a Bronchial Tube of moderate size, a large Portion of the Lungs may be inflated.

The Trachea consists of *Cartilaginous Rings*, about sixteen or eighteen in number, the number varying a little according to the length of the Neck.

The Cartilages give strength and firmness to the Trachea, and preserve it constantly open for the transmission of Air. They are incomplete, however, behind, where the Trachea is formed of a *flat, soft, fleshy Substance*, which is closely connected with the Esophagus, and yields to it in the time of Deglutition.

Each Cartilage forms a large Segment, or nearly two-thirds of a Circle, about a line or one-twelfth of an inch in breadth, and a fourth of a line in thickness.

The Cartilages are situated transversely, with respect to the length of the Trachea, and have their edges opposed to each other; small spaces intervening.

They are united to each other by a Ligamentous Substance, which is so elastic, that when the Lungs are taken out of the Body, it draws the Cartilages closely together.

At the upper end of the Trachea, two or three of the Cartilages are frequently joined by a union of Substance; but below this, they are perfectly distinct from each other. The last of the Cartilages is now and then triangular, to adapt itself more readily to the beginning of the Bronchi.

The Bronchi, at their beginnings, have the same kind of Cartilages with the Trachea, but after they enter the Lungs, each Cartilaginous Ring is divided into two or three pieces, which, however, are so connected to each other, as to go completely round the Bronchi, and keep the Passage open, and free from compression.

Upon tracing the smaller divisions of the Bronchi, the Cartilages are observed to become less numerous, and more separated from each other, till at length they vanish; the Capillary Branches becoming entirely Membranous, as well as the Vesicles in which they terminate.

The Trachea has several *Coats* entering into its composition, some for strengthening it, others for giving it a certain degree of motion, viz.

A *Cellular Coat*, which, in the Thorax, is covered by the Mediastinum;

An *Elastic Ligamentous Coat*, which passes along the Trachea, and also upon the different Branches in the Substance of the Lungs, adding much to the elasticity of these;

A *Muscular Coat*, placed between the Cartilages and in the back part of the Trachea, and composed of Circular Fibres without, and Longitudinal Fibres within; —the former for straitening, the latter for shortening the general Passage.

The Longitudinal Fibres are collected into Bundles, which are distinctly seen through the inner Coat, and may be traced considerably farther than the Cartilages in the Substance of the Lungs.

A very *Vascular* and *Irritable Membrane*, continued from the Mouth, which lines the inner side of the Trachea, and forms at last the extreme Branches, which terminate in the Cells of the Lungs.

The inner Membrane of the Trachea is every where perforated by the *Ducts* of *Mucous Glands*, and by the *Mouths* of the *Exhalent Arteries*, the former pouring out Mucus to lubricate the Lungs, the latter the vapour which is thrown off in Expiration.

Three different kinds of Glands are connected with the Trachea,—the *Thyroid*, which has already been described, the *Tracheal*, and the *Bronchial*.

The *Tracheal Glands* are small, but numerous, and of different sizes, surrounding the Muscular Coat of the Trachea, and its Branches in the Lungs;—the largest of them are placed in the Fleshy Substances behind, the smallest are situated between the Cartilaginous Rings, and appear to have been overlooked by Authors in general.

From each of these Glands a small Duct issues, and throws out a Mucus to defend the inner Surface of the Trachea from being injured by the Air, or by the extraneous particles which it carries along with it.

The *Bronchial Glands* are placed in the Cellular Substance round the under end of the Trachea and roots of the Bronchi, where these penetrate into the Substance of the Lungs.

They are of various sizes, from that of the point of the Little Finger to that of a millet-seed, and have a bluish or blackish colour, corresponding in a great measure with the colour of the darkest parts of the Lungs.

They were formerly considered by many Authors as sending Fluids to the Trachea, and particularly the dark Mucus which is occasionally expectorated; but they are now universally known to be entirely of the Lymphatic kind,—the Absorbents of the Lungs passing through them in their way to the Thoracic Duct.

The Trachea is furnished with Blood-vessels from the Inferior Laryngeals, and *Nerves* from the Recurrents and Great Sympathetic Pair.

The Trachea serves to convey Air into, and out from, the Cells of the Lungs, during Respiration, and to carry off the Perspirable Matter from the Arteries in the time of Expiration.

The *Blood-vessels* of the Lungs consist of the *Pulmonary* and *Bronchial Vessels ;* the one for the general circulation, the other proper to the Lungs.

The Pulmonary Blood-vessels have been already taken notice of in p. 182, 183. But here it may be proper to observe, that the Minute Branches of the Artery, running in the common Cellular Substance of the Lungs, form at last a *Plexus* upon the proper Cells, sometimes called *Rete Mirabile*, vel *Rete Vasculosum* MALPIGHI. Part of this Plexus terminates in the Cells, and their corresponding Bronchi, by Exhalent Vessels, from which that Halitus is derived which is expelled by the Lungs in Expiration.

The *Pulmonary Veins* are commonly observed to be smaller, in proportion to the corresponding Arteries, than Veins are to Arteries in other parts of the Body, which has been supposed to be owing to the large quantity of Fluids expired.

The *Bronchial Arteries* arise by three or four small Branches ; one of which is from an adjacent right Superior Intercostal, the rest from the Trunk of the Aorta.

They are dispersed upon the Bronchi and Bronchial

Glands, and the Substance of the Lungs in general, and are found to communicate with Branches of the Pulmonary Artery.

The Bronchial Arteries are supposed to serve for the nourishment of the Lungs, and for the secretion of the Mucus.

The *Veins* return the Blood to the Vena Azygos, and Left Superior Intercostal Vein.

The *Lymphatics* form a Plexus upon the Surface of the Lungs:—They communicate freely with the deep-seated Absorbents, and pass through the Bronchial Glands.

The *Nerves* of the Lungs are partly from the Great Sympathetics, but chiefly from the Eighth Pair, and are rather small in proportion to the Bulk of the Organ on which they are dispersed.

The Lungs serve the general purpose of *Respiration*, which consists of *Inspiration* and *Expiration*, or the passage of the Air into, and out from the Lungs, by the alternate dilatation and contraction of the Thorax.

During Inspiration, the Thorax is lengthened by the descent of the lateral portions of the Greater Muscle of the Diaphragm; it is rendered wider by the elevation and expansion of the Ribs; and, by the ascent of these, is made deeper, the Sternum being at the same time thrust forward.

Moderate *Inspiration* is performed in consequence of the Thorax being dilated by the action chiefly of the Diaphragm, assisted in a small degree by the Intercostales; the Lungs, which are passive, and in contact with the Thorax, following it, and the Air rushing into the Trachea by its own gravity.

In strong Inspirations, additional Muscles are brought into action, as the Scaleni, Serrati Postici Superiores, Serrati Magni, and Pectorales Minores.

Expiration is performed in consequence of a relaxation of the Muscles which dilate the Thorax,—of the contraction of the Abdominal and a few other Muscles, assisted in strong Expirations chiefly by the Triangulares Sterni, Sacro-lumbales, and Serrati Postici Inferiores,—of the elasticity of the Cartilages of the Ribs, and the elasticity and contractile nature of the Bronchi, by all which circumstances the Cavity of the Thorax is diminished, and the Air is expelled from the Lungs.

Upon the alternate states of Inspiration and Expiration depend the formation of the Voice, the sensation of Smell, and all the other functions of the Body :—But the great and principal office of the Lungs, which was formerly supposed to be that of cooling the Blood overheated by friction, is, during Respiration, to make such changes upon that Fluid as may be necessary for Animal life.

Air that has been expired differs from Atmospheric Air, in having less Oxygen, and in containing Carbonic Acid Gas ; it is also charged with watery vapour.

The quantity of Air taken at every Inspiration has been differently estimated by different Authors ; by some it is rated at 40, while others make it as low as 14 cubic inches. The quantity must vary with the size of the Thorax, and state of the Lungs.

According to some, it appears,—that the Venous Blood passing to the Lungs, of a dark red or purple colour, is charged with Carbon or Hydrogen ;—that while circulating upon the Bronchial Cells, part of the

Oxygen, contained in the Air which has been inspired, unites with the Carbon and Hydrogen, and forms fixed Air and a watery Halitus, which are carried off by Expiration.—Others suppose that part of the Oxygen of the Atmosphere is imbibed by the Blood, which, in consequence of these changes, or having received an Arterial quality, returns from the Lungs of a florid red colour, and full of heat in a latent state; that this, in the course of the general circulation, by the Oxygen uniting with the Carbon, and forming Carbonic Acid, becomes sensible, and is diffused over the different parts of the Body, the Carbonic Acid being carried by the Veins to the Lungs, where it is evolved.—According to the latest Experiments, however, it is stated that the Blood, during the Circulation, acquires an excess of Carbon, which, in its passage through the Lungs, unites with the Oxygen of the Air, and forms Carbonic Acid; and that thus the Venous is changed into Arterial Blood, which, owing to this change, affords a stimulus to the Arteries, and promotes the different Secretions.

ESOPHAGUS.

The ESOPHAGUS, called also *Gula* or *Gullet*, derives its name from carrying what is eaten into the Stomach.

It is a Fleshy Canal, which begins from the inferior part of the Pharynx, descends along the Neck, and through the Thorax, following nearly the direction of the Spine.

It is situated between the Trachea and Vertebræ, and in the Neck inclines a little to the left side. In the Thorax, it proceeds behind the Base of the Heart, and between the Layers of the Posterior Mediastinum, from which it receives a lateral covering.

Soon after entering the Thorax, it makes a slight turn to the right, and passes down upon the fore and right side of the Aorta; consequently the Artery and it are prevented from injuring each other by pressure.

In its progress, it inclines more forwards and to the left side; and about the ninth Dorsal Vertebra, it perforates the Muscular part of the Diaphragm, and afterwards terminates in the upper Orifice of the Stomach.

It has several *Coats* proper to it, the first of which is *Cellular*, and connects it to the adjacent parts.

The second Coat is *Muscular*, and is sometimes termed *Vaginalis Gulæ.*—It consists of two Layers; the external of which has thick, strong, longitudinal Fibres, somewhat fasciculated. A portion of these ascends some way up the Pharynx on each side, to be fixed to the back part of its Inner Membrane. The internal Layer is formed of circular or transverse Fibres, and is thinner than the former.—The outer Layer is fitted for shortening and relaxing, and the inner for contracting the Canal, during Deglutition.

The third Coat is termed *Nervous*, and is considered by some as a continuation of the Cutis Vera, but is more properly called Cellular, being formed of loose Cellular Substance, which connects the Muscular to the Inner Coat.

The *Inner Coat* is continued from the lining of the Mouth; it consists of many longitudinal *Plicæ*, which are distinctly seen when the Esophagus is contracted, but are scarcely visible when the Tube is dilated. It is also furnished with numerous Foramina, which discharge a Mucus from corresponding Glands, for lubricating the passage, and facilitating Deglutition.

The *Arteries* of the Esophagus are Branches of the Inferior Laryngeals, and supply the Cervical part of it, and the Esophageals and Branches of the Bronchials, which are derived from the Aorta Descendens, and supply the Thoracic Portion.

The *Veins* go to the Inferior Laryngeals, to the Vena Azygos, and to the Left Superior Intercostal Vein.

The *Absorbents* are numerous, and intermix with those of the Heart and Lungs.

The *Nerves* are chiefly from the Eighth Pair.

The Esophagus receives the Aliments from the Pharynx, and conveys them to the Stomach.

THORACIC DUCT.

The THORACIC DUCT is a small Membranous-like Canal, situated at the back part of the Thorax, and is the principal Trunk of the Absorbent System.

It begins upon the third Vertebra of the Loins, and passes behind the Aorta, crossing obliquely from left to right, till it gets to the right side of that Artery.

Upon the first Lumbar Vertebra, it forms an *Oval Sac*, termed *Receptaculum Chyli*, which is placed behind the Right Crus of the Diaphragm, and a little higher than the Right Renal Artery.

The Duct afterwards passes between the Crura of the Diaphragm, and ascends in the Thorax, on the anterior part of the Spine, between the Layers of the Posterior

Mediastinum, on the right side of the Aorta, and between it and the Vena Azygos.

It crosses behind the upper part of the descending Aorta, and emerges from the Thorax, to reach the under part of the left side of the Neck.

In the Neck, it passes behind the Internal Jugular Vein, and a little higher than the Subclavian.

It then turns downwards, forming an Arch, which terminates in the upper part of the Angle, between the Internal Jugular and Subclavian of the left side.

The Thoracic Duct receives the Chyle from the Lacteals, and Lymph from the Lymphatics, and discharges these into the red Veins.

OF THE ABDOMEN.

THE *Abdomen*, or *Belly*, extends from the Thorax to the under part of the Trunk.

It is bounded above by the Diaphragm, and the Bones to which that Muscle is fixed; below, by the Pelvis; behind, by the Lumbar Vertebræ and Muscles of the Loins; anteriorly, by its proper Muscles; and laterally, by the False Ribs, Ossa Ilii, and Muscles connected with these;—all of which have been described in their places.

It is divided into *three Regions*, termed *Upper*, *Middle*, and *Under* Region; each of which is subdivided into three others.

The *Upper Region* begins opposite to the Cartilago Ensiformis, at a small depression called *Scrobiculus Cordis*, and descends to about a hand-breadth from the Umbilicus, or to a line extending between the Cartilages of the eighth pair of Ribs.

The middle of this Region is termed *Epigastrium*, or upper part of the Belly, and the two lateral parts *Hypochondria*, from their lying under the Cartilages of the False Ribs.

The *Middle Region* occupies an equal distance above and below the Umbilicus.—The middle part of it is called the *Umbilical*, and its lateral parts the *Lumbar Regions* or *Loins*.

The *Under Region* begins where the middle one terminates, or at a line drawn between the superior-anterior Spinous Processes of the Ossa Ilii, and forms, in the middle, the *Hypogastrium*, or bottom of the Belly; and at the sides, the *Iliac Regions*.

The Abdomen is covered on the outside by the *common Integuments*, and lined within by the Peritoneum, in the manner the Thorax is lined by the Pleura, but without being divided by the intervention of a Partition.

The Abdomen contains the *Chylopoietic* and *Assistant Chylopoietic Viscera*, or *Organs of Digestion*,—the *Organs of Urine*, and *part of those of Generation*, with the *Vessels* and *Nerves* which belong, some of them to these Viscera, and others to the lower parts of the Body.

The *Chylopoietic Viscera* comprehend the Stomach, which is situated in the upper and left part of the Abdomen,—the *Intestines*, which fill the greater part of it,—and the Membranes, termed *Omenta* and *Mesentery*, which are connected with these.

The *Assistant Chylopoietic Viscera* consist of the *Liver*, which is placed in the upper and right side of the Abdomen,—of the *Spleen*, which is situated in the upper and left side of it,—and of the *Pancreas*, which lies under the Stomach.

Of the *Organs of Urine*, the *Kidneys* are placed in the back part of the Abdomen, and the *Bladder*, with some of the *Organs of Generation*, in the Pelvis.

PERITONEUM.

The *Peritoneum*, named from its being stretched or spread around the Bowels, is a firm but simple serous Membrane, by which the Abdominal Viscera are surrounded and partly supported, and the Walls of the Abdomen lined, as already observed, somewhat after the manner the Pleura covers the Lungs, and lines the Cavity of the Thorax.

Its External Surface is rough and Cellular, and closely connected with the parts to which it belongs.

The Internal Surface is remarkably smooth, and lubricated by a Liquor which is exhaled from its own Vessels, without the interference of Glands.

It is very elastic, and admits of great extension, as happens in Utero-gestation, Corpulency, Ascites, and Hernia; but, upon the causes of extension being removed, it returns to its former dimensions.

It lines the Diaphragm, and passes downwards, adhering firmly to the Abdominal Muscles.—It also lines the containing, and covers the contained parts of the Pelvis, from which it is reflected in the back part of the Abdomen, lining the Muscles there, and, by its reduplications, covering the Bowels and great Blood-vessels of that Cavity. Strictly speaking, however, the Abdominal Viscera may be said to lie on the outside of the Peritoneum.

In its passage from one Bowel to another, it forms Doublings which serve as Ligaments to fix the Bowels to each other, and likewise to the Body.

It gives a general covering to most of the Bowels, a partial one to a few, and to those which are deep-seated, and project least, a still more partial covering.

It forms a large Sac, the posterior part of which adheres firmly to the different Viscera, and the anterior to the Abdominal Muscles;—the part lining the Abdomen being merely in contact with its contents, and allowing a small degree of motion.

The Cellular Substance on the External Surface of this Membrane, is not every where of equal thickness, being in some parts, as upon the Bowels, remarkably thin; in others, as over the Kidneys, filled with a considerable quantity of Fat.

The Cellular Substance forms various Processes or Productions, some of which, as those on the Spermatic Cords, pass through Foramina, to be connected with the neighbouring parts; and the Processes are sent off without affecting the Internal Membrane; the one not accompanying the other.

The *Arteries* of the Peritoneum come from the Internal Mammary, Epigastric, Inferior Intercostal, Lumbar, Sacral, and Ilio-Lumbar Arteries, and from those which supply the Abdominal Viscera.

The *Veins* have the same course, bear the same names with the Arteries, and in general pass to the Inferior Cava.

The *Absorbents* are numerous, and run chiefly to the Iliac and Lumbar Plexus.

The *Nerves*, which are few in number and small, are from the Phrenic, the Inferior Dorsal, the Lumbar, the Great Sympathetic and Sacral Nerves.

Its Blood-vessels, however, are not very numerous, neither does it possess much Sensibility when free from disease.

The Peritoneum lines and strengthens the Cavity of the Abdomen; incloses and assists in supporting the different Viscera; furnishes most of them with an External Coat; connects them to the Body; and, by its smoothness and slipperiness, prevents the effects of Friction.

Between the Peritoneum and Abdominal Muscles, are *Four White Lines*, or small Cords, three of which are Vessels in the Fœtus,—one of them a Vein, and two of them Arteries; the fourth is the Urachus.—In an Adult, they are shrivelled, and serve as Ligaments; the Vein forming the round Ligament of the Liver, the three other Cords forming Ligaments of the Bladder.

STOMACH.

The *Stomach* is a large Bag or Reservoir, situated obliquely across the upper and back part of the Abdomen, in the Epigastric and left Hypochondriac Regions.

It is turned downwards and forwards, so as to form an Angle with the Esophagus, the Angle becoming more conspicuous in proportion as the Stomach is more distended.

The right portion of the Stomach is situated under the left part of the Liver, the rest of it is placed immediately under the Diaphragm; and in the upright position of the Body, the Stomach rests upon the Intestines.

The Stomach is long, round, and tapering, and has been compared in shape to the Bag of a Bagpipe, or to a Cone, with the Base drawn back towards the summit; but in certain morbid cases, the Stomach is found spasmodically contracted at its great curvature, near the Pylorus, so as to represent two Sacs of unequal size. This appearance commonly vanishes soon after death, though in some cases it remains permanent. Contractions of a similar nature are frequently met with in the tract of the Intestinal Canal.

The size of the Stomach is in proportion to the quantity of Aliment it has been accustomed to receive, and therefore is commonly larger in Men than in Women.

It has a *Large* and *Small Extremity*, an *Upper* and *Under Surface*, a *Great* and *Small Curvature*, a *Left* and *Right Orifice*, and consists of several *Layers* or *Coats*.

The *Large*, called also the *Left Extremity*, or *Base*, is situated in the Left Hypochondriac Region, and forms the great *Cul de Sac* of the French. This is in contact with the Spleen, and is considerably higher than the *Small* or *Right Extremity*, or small *Cul de Sac*, which is placed in the Epigastric Region, and approaches more or less towards the Right Hypochondrium, in proportion as the Stomach happens to be more or less distended.

The *Upper Surface* is turned towards the Diaphragm, the *Under* towards the Intestines;—but when the Abdomen is laid open, unless the Stomach be considerably distended, it falls back against the Spine, so that the superior Surface becomes anterior, and the inferior Surface posterior.

In the empty state of the Stomach, its opposite sides, internally, are in contact; but they gradually recede from each other in proportion as it becomes distended.

The *Large Curvature* is turned obliquely forwards and downwards towards the Abdominal Muscles, and extends from one Orifice to the other.

The *Small Curvature* is opposed to the large one, and turned backwards and upwards, towards the Spine, extending also between the two Orifices.

The *Orifices* are next the Small Curvature. The Left is termed *Cardia, Os Ventriculi*, or *Upper Orifice* of the Stomach.—It is placed at the right side of the great extremity, and is opposed to the Spine, but at a little distance from it, and is formed by the termination of the Esophagus.—It allows a free passage for the Food into the Stomach, the return of which is prevented by the Angle formed between the Stomach and Esophagus, by the Fleshy parts of the Cardia, and by the Fleshy Crura of the Diaphragm, between which the Cardia is situated.

The *Right* or *Inferior Orifice*, commonly termed *Pylorus*, is situated under the small Lobe of the Liver, a little to the Right side of the Spine,—is turned more forwards than the Cardia, and is considerably lower than it, but rises in proportion to the distension of the Stomach.

The Stomach is connected by the Cardia to the Esophagus,—by the Pylorus to the beginning of the Intestines,—by the Peritoneum and Blood-vessels to the Spleen,—and by a reflection of the Peritoneum to the root of the Liver, and to the part of the great Intestines termed *Arch* of the *Colon.*

The *Structure* of the Stomach is in general similar to that of the Esophagus, of which it is a kind of expansion.

The *Coats* of the Stomach are *Four* in number.

The First, or *External Coat,* called also *Peritoneal,* is a reflection of that part of the Peritoneum which comes from the root of the Liver.

It is remarkably thin, but dense and somewhat elastic. It strengthens the Stomach, prevents it from being over distended, and, by its smoothness, being constantly lubricated by a liquor discharged from the exhalents of the Peritoneum in general, diminishes the effects of Friction; and, possessing few Nerves or Blood-vessels, it is not very susceptible of pain or inflammation.

The Cellular Substance under the Peritoneal Covering is described by some Authors as a distinct Coat, called *Tunica Cellulosa Ruyschiana*;—but ought not to be numbered among the Coats of the Stomach.

The Second, or *Muscular Coat,* is composed chiefly of two Planes of Fibres variously disposed.

The External Plane is longitudinal. It extends from the longitudinal Fibres of the Esophagus, and follows the same general course with that of the Stomach from the Great to the Small Extremity.

Upon each side of the small Curvature, the External Plane forms a thick strong Band of Muscular Fibres, which strengthen the parts to which they belong.

The second Plane is chiefly transverse or circular, and considerably thicker and stronger than the other.

Its Fibres are intersected by many small, white, Tendinous-like Lines;—these, however, are in a great measure formed of that Cellular Substance by which the two Coats are united.

The Muscular Coat assists in the Digestion of the Food, by giving a gentle motion to the Stomach, according to the direction of its Fibres; the one set shortening it, the other rendering it narrower, and both sets accommodating themselves to the quantity of contained Aliment.

The Pylorus is formed by a doubling of the two inner Coats, which project into the Passage between the Stomach and Intestines, and contain a Circular Muscle, called *Sphincter Pylori*.

The Pylorus varies considerably in different persons, being sometimes circular, at other times oval; in some it is thick, in others it is thinner, which gives, of course, a difference in appearance to the Orifice it forms.

The Pylorus, by contracting, prevents the grosser indigested parts of the Aliment from escaping, and, by dilating, allows the Pulpy digested part to pass to the Intestines.

The Third *Coat*, commonly called *Nervous*, sometimes *Vascular*, but properly *Cellular*, consists of a large quantity of fine Cellular Substance without Fat, and is intermixed with and supported by, small Aponeurotic-like Filaments, which cross each other obliquely, but which are also of a Cellular nature.

This Coat, which, like the corresponding one in the Esophagus, has been compared by some Authors to the

Cutis Vera, strengthens the Stomach, and allows the Vessels to be distributed to the Inner Coat, with which it is intimately connected.

The Fourth, or *Inner Coat*, called also *Villous*, and by the Ancients *Fungous*, is continued from the Inner Coat of the Esophagus, but has much more of a Velvet appearance than it.—It is formed of fine, short, prominent Villi, which are crowded with small Vessels, some for furnishing a Mucous Liquor to the Stomach, others for absorbing a portion of the thinner parts of the Food.

The two last Coats are more extensive than the rest, and form, upon the inner part of the Stomach, many Doublings, termed *Rugæ*, the greater number of which run in a waving transverse direction, and are afterwards divided into a sort of *Net-work*. Near the Orifices, however, they have more of a longitudinal course. At the Cardia the Rugæ have a radiated appearance, the Radii corresponding with the longitudinal Plicæ at the under end of the Esophagus. This radiated part has been considered by some late Writers as the termination of the Cuticle, or as that Membrane after reaching the Stomach, being altered in its texture.

The Rugæ of the Stomach, like the Plicæ of the Esophagus, are most distinct when the Stomach is empty;—when it is full, they are much less evident.

They admit of distension, without endangering the Vessels and Nerves dispersed in them, and assist a little in detaining the Aliment till properly digested.

From the inner Surface of the Stomach, a *Liquor* issues, termed *Gastric Juice*, which has something of the general appearance of the Saliva, but is different in its qualities.—This was formerly supposed to come from Glands seated in the Third Coat, but is now more frequently considered as a Secretion from the Arteries of the Stomach, no Glands being evident there, at least in the sound state of this Viscus, unless we consider the Villi as such; though in some Animals, as an Ostrich, there are numerous Glands which pour Mucus into the Stomach.

The Arteries of the Stomach are derived from the Cœliac Artery. They consist of the Superior Gastric, which supplies the place next the small Curvature; of the Right Inferior Gastric, which goes to the large Curvature, and is a Branch of the Hepatic; of the Pyloric Arteries, which are small Branches from the Gastrics and the Hepatics; and of the Left Gastric and Arteriæ Breves, which are Branches of the Splenic Artery.

When the Arteries arrive at the Curvatures of the Stomach, they separate into two Layers, or Sets of Branches; the inner is spread out upon the Nervous Coat, and is distributed to the Villi by Filaments, which form a most delicate Plexus. The External Layer is expanded under the Peritoneal Coat, supplying it and the Muscular one with numerous Branches, which form frequent Anastomoses with each other.

The *Veins* have the same names, and nearly the same course, with the Arteries. The whole of them terminate in the Vena Portæ.

The *Absorbents* of the Stomach are numerous and large. They pass through small Glands situated upon its Curvatures, and go afterwards to the Thoracic Duct. They appear to carry Lymph only, no Chyle having been detected in them, even in cases where the Lacteals were found full of it. Yet the Author has seen a few Absorbents filled with a white Fluid like Chyle, on the Stomach of a Dog fed with Milk some hours before death.

The *Nerves* are chiefly from the Eighth Pair, and partly from the Great Sympathetics, and are most numerous upon the Cardia.

The Stomach receives the Food from the Esophagus, and afterwards prepares it, by Digestion, for the Intestines.

The Digestion of the Food in the Stomach is found to be effected,—by Triture, which is performed by the motions of the Stomach, and Muscles of the Abdomen and Diaphragm,—by Dilution,—by a partial Fermentation,—but chiefly by the Solvent Power of the Gastric Juice.

With respect to the real nature of the Gastric Juice, Authors are not yet sufficiently informed; partly owing to the difficulty of obtaining it pure and unmixed with the Saliva, &c. and in sufficient quantity.

It appears from experiments, that it is adapted to the Food on which the Animal is accustomed to live, and of course, is different in different classes.

In young Animals in particular, it has the power of coagulating Milk, and it is found to act entirely in a chemical manner, for it operates not only on the Aliments in the Stomach, but on the dead Animal Fibre out of the body; and, in several instances, part of the Stomach itself has been found dissolved by it after death.

The Gastric Juice is also observed to have an antiseptic quality, as it arrests the progress of putrefaction where that has begun.

After the Food in the Stomach has been exposed for some time to the Agents mentioned above, it loses its tenacity, becomes somewhat gelatinous, and is changed into a greyish-coloured pulpy Fluid termed *Chyme.*

Besides the Aliments we take in, the Stomach and Intestines commonly contain different Gases, which appear to be generated there; and also common Air, which is supposed to be swallowed with the Food.

In the perfectly healthy state of the body, part of the Aeriform Fluid appears to be consumed, at least it does not increase to such a degree as to create any unusual distension.

The Gases which were found in the Stomachs of four criminals executed at Paris some time ago, were Oxygen, Carbonic Acid, Hydrogen, and Azote, in various proportions in the different parts of the Canal.

From these experiments it appears, that the Oxygen Gas gradually decreases, and at last vanishes in the course of the Canal, while the proportion of the Carbonic Acid and Hydrogen Gases increases; and that the largest proportion of the Gases in the Alimentary Canal is Azote.

INTESTINES.

THE *Intestines* consist of a long Cylindrical Canal, which begins at the Inferior Orifice of the Stomach, and, after winding in various directions, terminates in the Anus.

In general they are about six times the length of the Body to which they belong; though, in a person of short stature, the proportional length of the Intestines is greater, and *vice versa.*

They occupy a large part of the Abdomen, and are connected to the Body through their whole extent, by a Doubling of the Peritoneum.

On account of the inequalities of their size, they are divided into *Small* and *Large* Intestines, and each of these again have their subdivisions.

SMALL INTESTINES.

The *Small Intestines* are smooth on their outer Surface, and of a tapering form, becoming gradually less in their diameter from their upper to their under extremity, and are divided into the *Duodenum, Jejunum,* and *Ilium.*

The *Duodenum* begins at the Pylorus, and makes a short turn upwards and backwards, by the Neck of the Gall Bladder, to which it is contiguous; having the Anterior Layer of the Omentum fixed to its inferior part, and the Omentum Minus to its opposite side.

It then passes obliquely downwards and to the right side, before the Great Vessels which go into the Liver, and likewise before the Renal Artery and Vein; the Gut being here included in the Cellular Substance of the Meso-colon.

Opposite to the under part of the right Kidney, it makes a turn to the left side, and is now lodged in the common root of the Meso-colon and Mesentery, receiving into its back part the ends of the Biliary and Pancreatic Ducts, and at the upper part of the Lumbar

Vertebræ, going over the Aorta and Vena Cava, and under the superior Mesenteric Vessels.

In passing across these Vessels, it ascends a little till it gets to the left side of the Spine; then, perforating the common root of the Mesentery and Meso-colon, it makes a turn forwards, and obtains the name of *Jejunum.*

The *Jejunum,* so named from its being commonly more empty than the other Intestines, in consequence of the thinner parts of its Contents being sooner absorbed, begins at the last turn of the Duodenum, and forms numerous Convolutions, which run in all directions, and are situated at the upper part of the Umbilical Region.

The *Ilium,* named from its numerous Turns, begins where the Jejunum terminates, or where the Internal Plicæ become less conspicuous, and is distinguished externally from that Gut, by being smaller, thinner in its Coats, and paler, and from its forming about three-fifths of the length of the two Intestines.

The Ilium, like the Jejunum, forms many Convolutions, which are situated on the under part of the Umbilical Region, and extend as far as the Hypogastric and Iliac Regions, and not unfrequently, especially in Women, into the Cavity of the Pelvis.

It surrounds the lateral parts of the Jejunum, and is supported by the Ossa Ilia; and, the last turn of the Gut passing across towards the upper edge of the Right Os Ilium, it terminates by a Valve in the posterior and left side of the beginning of the Colon.

Through the whole of this course, the Jejunum and Ilium are fixed to the Spine by a continuation of the

Mesentery, but in such a manner that they are allowed to float in the Cavity of the Abdomen, and to give way to the Stomach in proportion as it becomes distended.

Great Intestines.

The *Great*, like the Small Intestines, form one continued Canal, which tapers from its upper to near its under extremity; but they differ from them in being considerably wider, shorter, and straighter,—in being irregular on their outer Surface, and tacked up into Cells,—and in having many Processes upon them, termed *Appendiculæ Pinguedinosæ.* They differ likewise considerably in their internal appearance.

Like the Small Intestines, also, they are divided into three parts, termed *Cæcum*, *Colon*, and *Rectum.*

The *Intestinum Cæcum* forms a Short Bag, only about three or four Inches in length, and nearly the same in diameter. The Cæcum, strictly so called, is that part of the Intestine which lies under the insertion of the Ilium, though more frequently the dilated beginning of the Colon is distinguished by the same name.

It is situated in the Right Iliac Region, resting on the Cavity of the corresponding Os Ilium, at the under end of the Right Kidney, and is concealed by the last Convolutions of the Ilium.

The bottom of it is turned downwards, and forms a shut Sac; the mouth of which is directed towards the Colon. This Sac may be considered as forming the *Cæcum Caput Coli.*

At the posterior and left side of the Cæcum, there is a *Small Process* about the same length with the Cæcum itself, but the diameter not larger that that of a Goose-quill,—termed *Appendix Vermiformis*, from its resemblance to an Earth-worm, and *Appendix Cæci*, from its connexion with the Cæcum.

It is convoluted, variable in its length, and fixed by its sides to the Cæcum.

It has two extremities, one of which is impervious, the other opens obliquely into the back part of the Cæcum.

The *Colon* is by much the longest of the large Intestines. It encircles the small Guts, and is contiguous to most of the Abdominal Viscera.

It is a continuation of the Cæcum, beginning at the termination of the Ilium.

It ascends in the Right Lumbar Region, over the Kidney of that side, to which it is connected, and is here sometimes termed *Colon Dextrum*.

From the Kidney, it passes forwards, and crosses the Abdomen in the Epigastric and Hypochondriac Regions connected to the Duodenum, under the name of *Great Arch of the Colon*, or *Colon Transversum*.

The right portion of the Great Arch is situated under the Liver and Gall-Bladder, the latter of which, after Death, commonly tinges part of it and the Duodenum with Bile.

The left Portion of the Arch is situated under the Stomach; and immediately below the Arch are the Convolutions of the Jejunum.

In the Left Hypochondrium, the Colon turns backwards under the Spleen, and descends in the Left Lumbar Region, on the fore side of the Kidney, to which also it is closely connected. Here it is sometimes called *Colon Sinistrum*.

In the left Iliac Region it forms two Convolutions, compared in shape to the Greek letter ς, and hence called *Sigmoid Flexure* of the Colon, which afterwards constitutes the Rectum.

The *Sigmoid Flexure* varies considerably in length in different Persons, extending frequently into the Hypogastric Region, and in some instances as far as the Intestinum Cæcum.

The Colon, through its whole extent, is fixed to the Body by means of the Meso-colon.

The *Rectum*, which has its name from its being among the straightest of the Intestines, begins at the last Lumbar Vertebra, descends upon the fore side of the Os Sacrum and Os Coccygis, and terminates in the Anus, a little beyond the extremity of the last-named Bone.

In its course it follows the direction of the Bones over which it passes; turning first downwards, then a little backwards, next forwards, and is fixed to them by the Meso-rectum.

The Rectum differs from the other Intestines, in becoming wider in its progress downwards, and forming below a Reservoir for the Fæces.

At the Anus, it contracts into a narrow Orifice, the sides of which are disposed in close longitudinal Folds.

Upon the Outer Surface of the great Intestines, but more especially upon the Colon, are the *Appendiculæ Pinguedinosæ*, situated at different distances from each other,—thin at their roots, becoming thicker in their bodies, and projecting from the Intestines like so many pendulous Papillæ.

They are covered by the Peritoneum, continued from the Surface of the Intestine, and are of the same structure and use with the Omentum.

Besides the Appendiculæ, there are on both sides of the adhesion of the Meso-colon to the Intestine, *Adipose Strata*, which are also of the same nature with the Omentum.

The Colon is divided, longitudinally, into three parts, by as many *Ligamentous-like Bands*, which run upon its Surface.

One of them goes along each side of the Colon; and that most exposed to view, when the Omentum is turned up, is the largest: The third, which is the smallest, and which was discovered by MORGAGNI, is concealed by the attachment of the Meso-colon.

They begin at the root of the Appendix Vermiformis, and, after running along the Cæcum and Colon, they gradually unite into two, which afterwards spread uniformly over the Rectum.

MESENTERY.

The *Mesentery* is formed by a doubling of the Peritoneum, which is detached forwards, and includes the Intestines as in a Sling.

It is named from its situation in the middle of the Intestines, and is divided into two parts, one connecting the Small Intestines, and retaining the name of *Mesentery*; the other, the Great Intestines, and termed *Meso-colon*.

The Mesentery begins at the last turn of the Duodenum, and runs obliquely downwards, and towards the right side, along the Vertebræ of the Loins, to the first, second, and third of which it is chiefly connected.

Between the two Layers of the Mesentery, are inclosed a considerable quantity of Cellular Substance and Fat, with the numerous Blood-vessels, Nerves, Lacteal Vessels, and Glands of the Jejunum and Ilium.

Its anterior edge is much more extensive than the posterior, being plaited or puckered up,—the Plaits corresponding with the Convolutions of the Intestines to which they are fixed, and which they prevent from being entangled in the various motions of the Body.

The *Meso-colon* is the continuation of the Mesentery, which, after reaching the lower extremity of the Ilium, contracts and obtains this name.

It follows the Course of the Great Intestines, and fixes them in their place; its different portions getting names from the parts of the Colon to which they are attached.

Under the Right Kidney it is narrow and firm, and forms the *Right Ligament* of the Colon.

Opposite to that Kidney, it appears to be lost by the immediate adhesion of the Colon to the Kidney and Duodenum.

It then turns across, and forms a broad Expansion, which incloses the Arch of the Colon at its anterior edge; and behind, it separates and incloses the anterior part of the Duodenum, and is fixed to the Spine.

It adheres a little to the under part of the left extremity of the Stomach, and then descends over the Left Kidney, at the under end of which it forms the *Left*

Ligament of the Colon. Here, as on the right side, it forms a partial covering to the Colon, the Gut being connected behind by Cellular Substance only.

It afterwards expands, adheres to the Psoas Magnus, and forms a Loose Fold, which retains the Sigmoid Flexure of the Colon.

At the last Vertebra of the Loins, it forms the *Meso-rectum*, which by degrees becomes narrower, and disappears towards the under part of the Pelvis; the Rectum being then immediately connected to the Os Sacrum.

Between the Layers of the Meso-colon are placed the Arteries, Veins, and Nerves, with the Absorbents and Glands of the Colon.

The Mesentery, in general, suspends, connects, and retains the Intestines in their places, but allows them a certain degree of motion; it furnishes them with an external Coat, receives their Glands, Vessels, and Nerves, and allows the two last to be properly distributed.

OMENTUM.

The *Omentum* or *Caul*, formerly called *Epiploon*, from its seeming to float upon the Intestines, is a fine Membranous Bag, produced from the Peritoneum, and intermixed with much Fat, and covers a large portion of the Anterior Surface of the Abdominal Viscera.

It is divided into *Omentum Gastro-colicum* and *Omentum-colicum*; the former common to the Stomach and Colon, the latter proper to the Colon: They are, however, a continuation of one and the same Substance.

The *Omentum Gastro-colicum* consists of an Anterior and Posterior part, each of which is originally formed of two Membranes intimately united.

The Anterior part is a continuation of the Peritoneal Coats, produced from the upper and under Surfaces of the Stomach.

This production arises from the whole length of the large Arch of the Stomach, and extends as far laterally as the beginning of the Duodenum and inner Surface of the Spleen, to both of which it is also connected. The Posterior part arises in a similar manner from the Peritoneal Coat covering the upper and under Surfaces of the Colon. The two portions thus produced from the Stomach and Colon, soon become incorporated, and form a thin production, which commonly extends, especially in Fat people, a little below the Umbilicus. Sometimes, however, it does not reach so far, at other times it descends as low as the Pubes, but without adhering to the Walls of the Abdomen, or to the small Intestines over which it is placed.

The *Omentum Colicum*, which is merely an Appendix of the Omentum, arises from the right part of the Arch of the Colon, in the same manner as the other portion of the Omentum arises from the left part of the Arch, and sends downwards and to the right side a Cuneiform Process, which is connected with the Colon Dextrum as far as the Cæcum.

Besides the Omentum, there is a Membrane much smaller, situated between the Liver and Stomach, termed *Omentum Hepato-gastricum*, or *Omentum Minus* of WINSLOW, or *Membrana Macilentior* of HALLER from its having little Fat in it.

It passes from the fore part of the Sinus of the Porta, to the under and back part of the Liver, to be connected to the whole edge of the small Curvature of the Stomach, and to the beginning of the Duodenum.

It is bounded on the left side by the Cardia, on the right by the Capsule of Glisson, on the upper part by the root of the Liver, and on the lower by the small Curvature of the Stomach.

Like the other Omentum, it is composed of two Layers, but is thinner, less fat, and more uniform in its structure than it.

After the Omentum Minus reaches the Stomach, its two Layers separate from each other, inclose that Viscus, and form its External Coat.

At the great Curvature of the Stomach, they rejoin and form the Anterior, which soon joins the Posterior part of the Omentum Majus.

The Posterior part is formed by the Peritoneal Coat of the Colon, in the same manner as the Anterior portion is produced from that of the Stomach.

At the opposite side of the Colon, the layers reunite, and form the Meso-colon.

By the Membrane thus continued, a large irregular Sac is formed, of which the Omentum Minus, Stomach, and Anterior portion of the Omentum Majus, constitute the Anterior, and the Posterior part of the large Omentum, the Colon, and Meso-colon, the Posterior part of this Sac.

In Young Subjects, the sides of this Sac are so complete, that it may be inflated from what is called the *Foramen* of WINSLOW; but in old emaciated people, the Layers of which it is composed become Cribriform or Reticular in consequence of Absorption.

At the upper and right side of the Sac, there is a Passage large enough to admit a Finger; this is the *Foramen* WINSLOII.

It is situated immediately behind the Cord of the Great Vessels which lead to the Liver, and is of a Semicircular form.

It is composed of the Peritoneum, under the appearance of two Ligaments which connect the surrounding parts to each other.

The Foramen of WINSLOW maintains a communication between the Large Sac of the Omentum and common Cavity of the Abdomen; from which circumstance Fluids generated by disease may readily pass from one of these Cavities to the other.

The Omentum, by its Fatty nature, serves to lubricate the Viscera, and to prevent them from being injured by Friction. Being suspended as a Curtain over the Intestines, it has also been supposed to retain the Heat that would otherwise escape from them; but a large portion of the Intestines has no covering from this Substance.

STRUCTURE OF THE SMALL INTESTINES IN GENERAL.

The *Structure* of the Small Intestines is nearly similar to that of the Stomach, and the number of their *Coats* the same.

The *External Coat*, excepting in a portion of the Duodenum, is a continuation of that part of the Peritoneum which forms the Mesentery. It closely surrounds the Intestines, adhering to them by fine Cellular Substance.

The *Second* or *Muscular Coat*, as in the Stomach, is composed of two Planes of Fibres; the External or Longitudinal of which are much more minute than the Internal.

The *Circular Fibres* are distinct and numerous: They consist of Segments of Circles, which unite with each other at different distances, so as to surround the Canal.

The *Longitudinal Fibres* shorten, and the *Circular* contract the Intestines; and upon the alternate relaxation and contraction of these Fibres depends that Vermicular motion forwards and backwards in the Canal, or that motion called *Peristaltic* and *Anti-Peristaltic*, by which the Aliments are intimately intermixed, the nutritive part applied to the Mouths of the Lacteals, and the fæculent part is discharged.

The *Third*, commonly called *Nervous Coat*, like that in the Stomach, is white and firm, and composed of Cellular Substance without Fat;—its firmness giving strength to the Intestines.

This Coat, like the corresponding one in the Esophagus and Stomach, though Cellular, forms a distinct Lamina, and, as in those parts of the Canal just mentioned, has by some been compared to the Cutis Vera covering the external Surface of the Body, though it is much looser in its texture.

The *Fourth*, or *Villous Coat*, differs from that of the Stomach, in being proportionally more extensive, and in forming, with the Cellular Coat, numerous transverse Plicæ or Folds, about an eighth part of an inch in breadth, termed *Valvulæ Conniventes*, from their serving as a kind of imperfect Valves, to retard the motion of the Food.

By this extension of the inner Surface of the Intestines, sufficient space is afforded for the absorption of the Chyle, and for the secretion of those Fluids which assist in the digestion of the Food, and in the lubrication of the Canal.

One edge of these Plicæ is fixed to the Intestine, the other is loose. They are much deeper than the Rugæ of the Stomach, and placed opposite to the Interstices of each other, and are of different lengths, not forming entire Circles.

The *Villi* of the Inner Coat are much more conspicuous than in the Stomach, being composed not only of the extremities of Arteries, Veins, and Nerves, but particularly of the Mouths of Lacteal Vessels, the Origins of which, however, are extremely small, and have a fungous appearance.

Numerous *Ducts* of *Simple* and *Compound Glands* terminate on this Coat, for the secretion of Mucus.

The former are called *Solitary*, and the latter *Congregate;* and, from their Describers, *Glandulæ* PEYERI, and *Glandulæ* BRUNNERI.

They are in the form of Papillæ, but so minute as seldom to be seen, excepting in a diseased state;—though they are supposed to be dispersed over the whole of the Canal.

They are seated in the Substance of the Nervous Coat, and serve to discharge that Matter, which, while it prevents the acrimony of the Aliments from injuring the Intestines, enables them to discharge their Contents.

STRUCTURE OF THE SMALL INTESTINES IN PARTICULAR.

The *Duodenum* is the most lax, and the straightest of the Small Intestines, and so large as to have been considered as a *Ventriculus Succenturiatus*, or *Secondary Stomach*.

It is of a redder colour than the rest, has a thicker Muscular Coat, receives only a partial covering from the Peritoneum, and is fixed more closely to the Body, without floating like the other Intestines.

It is perforated at the distance of three or four inches from the Pylorus, by the ends of the Biliary and Pancreatic Ducts, for the reception of Bile and Pancreatic Juice.

On the Duodenum, the Lacteal Vessels begin to make their appearance, and numerous Mucous Glands are found in it, especially near the Pylorus. The inner Surface presents only some irregular Rugæ, in place of Valvulæ Conniventes.

The Duodenum receives the Food from the Stomach, and detains it till it is mixed with the Bile and Pancreatic Juice.

The *Jejunum* differs from the Duodenum in deriving its common coat wholly from the Peritoneum,—in being smaller,—in having a weak Muscular Coat, the external Fibres of which are extremely minute,—and in the Valvulæ Conniventes, Villi, and Lacteals, which proceed from them, being much more conspicuous and numerous.

The *Ilium* differs from the Jejunum, in being less in diameter, in its Coats being thinner and of a pale colour, and in having fewer and smaller Lacteal Vessels.—In this Intestine the Valvulæ Conniventes gradually decrease in size and number, and at length entirely disappear.—At its under end, the Mucous Glands are distinct and frequent.

The Small Intestines in general admit the food to be divided into the Nutritive part or Chyme, and the Excrementitious part or Fæces. They promote the formation of the Chyle,—allow it to be separated from the Chyme, and to be absorbed,—and propel the remains of the Food into the Large Intestines.

STRUCTURE OF THE GREAT INTESTINES IN GENERAL.

The Great have the same number of Coats with the Small Intestines, but differ from them in being thicker and stronger.—The Valvulæ Conniventes are deep, and placed opposite to each other, and, like the Small Intestines, diminish in number and size towards the under extremity.—The Villous appearance is much less distinct.—The Mucous Glands are larger, but simpler than those of the Small Intestines.

STRUCTURE OF THE GREAT INTESTINES IN PARTICULAR.

The *Intestinum Cæcum* is of the same general structure with the rest of the Great Intestines: Its Villi are very short; and it has a number of solitary Mucous Glands, broader than those of the Small Intestines, which, when diseased, sometimes appear like Small-pox, with a Perforation in each.

The *Appendix Vermiformis* is of the same structure with the other Intestines, but contains no Fæces. It is furnished with numerous Glands, similar to those of the Duodenum, the contents of which pass into the Cæcum, a little below the Valve of the Colon, and assist in lubricating that Intestine, and facilitating the expulsion of the Fæculent Matter.

In the Cæcum and beginning of the Colon, the Food coming from the Ilium is retained for some time, and, in consequence of Absorption, acquires a greater degree of consistency. Here also it receives its fætid smell. After this, it may properly be considered as Excrementitious Matter.

The *Valvula Coli,*—sometimes called *Valvula Ilii,* or *Valvula* Bauhini, from its supposed Discoverer, and *Valvula* Tulpii, from the Author who gives a particular description of it,—is situated at the beginning of the Colon, and is placed transversely in the posterior and left part of that Intestine.

It is formed of a Projection of the Villous and Nervous Coats, and Circular Muscular Fibres of the Ilium, Cæcum, and Colon, and has two Folds or Lips, with an Aperture in form of a Mouth or Chink between them; but the size of the Folds, and of the Opening they inclose, varies in different Persons.

At the ends of the Valves are two Cords, termed *Retinacula,* vel *Fræna* Morgagni, which retain the Valve in its proper situation.

The Valve of the Colon allows a free passage for the contents of the Small into the Large Intestines, but completely prevents their return.

The *Colon* is of a similar structure with the Cæcum. —The inner Surface is smooth.—The Longitudinal

Muscular Fibres are collected upon it into three Fasciculi, which, with the Peritoneum covering them, form so many Ligamento-muscular Bands, that arise at the root of the Vermiform Process, and are continued along the Colon till they arrive at the Rectum, where they are first united into two parts, and then spread out into a uniform Coat.

The Longitudinal Bands are shorter than the rest of the Colon, and of course assist in diminishing its length, and forming it into Plicæ, which lie across the Gut, answering to the Valvulæ Conniventes; only they are at a greater distance from each other, and much larger; dividing the Intestines into little apartments, or Pouches, called *Cells* of the Colon.

The *Cells of the Colon*, with their Partitions, have a threefold order, the Intestine being almost quite smooth or plain, opposite to the Longitudinal Bands.

The Cells assist in preventing the too rapid descent of the Fæces.

The Colon receives the Excrementitious parts of the Aliment, retains them, till they are changed into Fæces, and then, by the Peristaltic motion of the Intestines and power of Respiration, pushes them, by slow degrees, to the Rectum.

The *Rectum* differs from the Colon in being covered only anteriorly and laterally by the Peritoneum:—Its Muscular Fibres are stronger and thicker, and spread uniformly over the Intestine. The Circular Fibres are so considerable at the end of the Rectum, as to have been named *Internal Sphincter* of the Anus.

The Rectum has no Cells like the Colon; but the Cellular and inner Coats are so much larger here than they are higher up, as to fall into Transverse Folds, which, however, disappear in proportion to the distension of the Intestine.

The middle and under end of the Rectum has numerous large Mucous Glands or Follicles.

The Extremity of the Rectum forms a firm Circle, which acts as a Valve, and assists the proper Sphincter, in preventing the involuntary discharge of the Fæces.

The Verge of the Anus is surrounded with deep Follicles, the contents of which prevent the tender Skin of the Anus from being excoriated by hard or acrid Fæces.

The Anus is also surrounded with a great deal of Fat, which admits of the dilatation of the Rectum, and facilitates the discharge of the Fæces.

The Rectum receives the Fæces from the Colon, retains them for a certain time, till, stimulated by their weight and acrid nature, it discharges them ; which it does by the power of its Muscular Coat, and that of the Levator Ani, assisted by the action of the Diaphragmatic and Abdominal Muscles.

The Fæces, according to the late experiments of BERZELIUS, consist, in the 100 parts, of Water 73.3, Vegetable and Animal Remains 7.0, Bile 0.9, Albumen 0.9, Peculiar and Extractive Matter 2.7, Salts 1.2, Slimy Matter, consisting of Picromel, Peculiar Animal Matter, and insoluble residue, 14.

The *Blood-vessels* of the Intestines are large and numerous, and are derived from different sources.

The Duodenum receives Branches from the Splenic and Hepatic Arteries.

The Jejunum, Ilium, and right half of the Colon, are supplied by the Superior Mesenteric Artery ; and the left half of the Colon, with the Rectum, by the Inferior Mesenteric Artery.

The *Veins* of all the Intestines send their Blood to the Vena Portæ.

The *Absorbents* of the Intestines are large and numerous.—They arise from the inner surface of the Canal, and run in the Mesentery and Meso-colon, passing through numerous Glands.—The Absorbents of the Small Intestines terminate in the Receptacle of the Chyle; those of the Large Intestines go partly to the Thoracic Duct, and partly to the Lymphatics of the Loins.

The Absorbents of the Great Intestines are strictly of the Lymphatic kind, the Chyle being completely absorbed while in the Small Intestines; yet they are capable of sending nourishment into the Constitution, for nutritious Injections thrown into the Rectum, have been found occasionally to support life, for the space of some weeks, in cases where nothing could be received by the Mouth.

The *Nerves* of the Intestines are very small, but numerous, and are derived partly from the Eighth Pair, but chiefly from the Great Sympathetics.

The Vessels and Nerves of the Omentum are Branches of those which supply the Stomach, and have the name of *Gastro-Epiploic.*

OF THE LIVER.

THE *Liver* is the largest of the Conglomerate Glands, and its weight nearly equal to that of the Brain. It forms a solid Mass, of a dusky red or brown colour, situated immediately under the Diaphragm, extending downwards to the Margin of the Thorax, but in the sound state not going beyond it.

It is placed partly in the Right Hypochondrium, which it in a great measure fills, and partly in the Epigastrium, reaching over a little way into the Left Hypochondrium.

It is *convex* and very *smooth* on the upper Surface, where it is opposed to the Diaphragm, though a little flattened on the upper part of its left side, where it is opposed to the Heart.

It is *irregularly concave* on the under side, where it rests upon the Stomach and Intestines, and is perforated by several large Blood-vessels.

It is *thick* on its right and posterior part, and becomes gradually *thinner* towards the left side; is *obtuse* or *blunt* posteriorly, where it is opposed to the Lumbar Vertebræ, and *acute* or *sharp* on its anterior edge, where it follows the Margin of the Right False Ribs.—It is considerably broader from one side to the other, than from before backwards.

It is divided into *Prominences* or *Lobes*, two of which, called *Great* and *Small*, or *Right* and *Left Lobes*, are so considerable as to form the Body and whole upper part of the Liver:—The other Lobes, which are very inferior in size, are placed upon the under side of the Great one.

The *Great Lobe* is situated obliquely in the Right Hypochondriac Region, following the Curve of the Diaphragm, and rests upon the Pylorus, Colon, and top of the Right Kidney.

The *Small Lobe*, which is diminutive in size when compared with the Great one, is distinguished from the latter by a broad Ligament, and is placed almost horizontally, chiefly in the Epigastric, only a small portion of it lying in the left Hypochondriac Region.

The other Lobes are,

The *Lobulus* Spigelii, which is small when compared with the two former Lobes, but is the principal one below.

It is situated near the Spine, upon the left side of the Great Lobe, and is of a pyramidal form, projecting like a Nipple, between the Cardia and Vena Cava, at the Small Curvature of the Stomach.

The *Lobulus Caudatus*, which is merely the Root, or one of the Angles of the Lobulus Spigelii, advancing towards the middle of the lower side of the Great Lobe, and representing a kind of Tail.

The *Lobulus Anonymus*, vel *Quadratus*, which is placed between the passage of the Round Ligament and the Gall-bladder, and is less prominent, but broader than the former Lobule.

From the Lobulus Anonymus, a Bridge, called *Pons* vel *Isthmus Hepatis*, runs across the passage for the Substance termed *Round Ligament*, to be joined to the Left Lobe:—The Pons Hepatis is sometimes wanting.

Upon the under side of the Liver, there are several Depressions and Fissures, which are occupied by the contiguous Viscera, of which the following are the principal:—

The *Great Fissure*, called *Fossa Umbilicalis*, between the Right and Left Lobes, at the under and fore part of the Liver, for the passage of the Umbilical Vein in the Fœtus, or the Round Ligament of the Liver in the Adult.

The Fossa Umbilicalis is terminated by a Notch at the fore part of the Liver,—of different depths in different Bodies;—and behind, it is commonly covered with the Pons Hepatis.

The *Principal Fissure*, termed *Sulcus Transversus*, vel *Sinus Portarum*, extending from right to left, between the Great and Small Lobes, and bounded by these Lobes at its extremities; by the Lobulus Anonymus before, and the Lobulus SPIGELII behind; the two latter forming parts compared by the Ancients to a Gate, and therefore called *Porta*.

The Porta receives the Great Blood-vessels and the

Nerves which go into the Liver, and transmits the Biliary Ducts and deep-seated Absorbents out from it.

The *Depression*, between the Great Lobe and Lobulus SPIGELII, for the passage of the Inferior Vena Cava, which has frequently a Bridge over it, forming it into a Canal.

A *Small Depression*, called *Fossa Ductus Venosi*, continued from the Fossa Umbilicalis, between the Left Lobe and Lobulus SPIGELII, running a little obliquely from right to left side, and receiving a Ligament, formerly a branch of the Umbilical Vein in the Fœtus.

The Liver is connected to the Body by different *Processes*, termed its *Ligaments* ; all of which, excepting one, are formed by Doublings of the Peritoneum, viz.

The *Ligamentum Latum*, vel *Suspensorium Hepatis*, placed between the Right and Left Lobes above, and extending below into the Fossa Umbilicalis.

The Ligamentum Latum is fixed obliquely to the Diaphragm and tip of the Ensiform Cartilage, and then descends in the same oblique direction, adhering to the inner edge of the Vagina of the Rectus Abdominis of the right side, as far as the Umbilicus.

The *Ligamentum Rotundum*, which was the Umbilical Vein in the Fœtus, placed in a doubling of the under part of the Ligamentum Latum, and fixed to the Umbilicus.

These two Ligaments have been supposed to resemble a *Falx*, with the edge turned uppermost, from which circumstance the Ligamentum Latum is sometimes also called *Falciforme*.

The *Ligamentum Coronarium*, considered by some as merely Cellular Substance, and by others as a reflection of the Peritoneum, or both.—It unites the root or posterior part of the Liver to the Tendinous portion of the Diaphragm.

The *Ligamentum Dextrum*, or *Right Lateral Ligament*, which is short, and connects the back part of the right extremity of the Great Lobe to the Diaphragm.

The *Ligamentum Sinistrum*, or *Left Lateral Ligament*, which is longer than the former, and connects the left extremity of the Small Lobe to the Diaphragm.

The two Lateral Ligaments are merely the extensions of the Coronary Ligament.

Besides the Ligaments already mentioned, two others are described by HALLER; one called *Hepato-colicum*, which passes from the Gall-Bladder and contiguous Sinus Portarum, across the Duodenum, to the Colon; —another termed *Hepato-renale*, which descends from the root of the Liver to the Kidney.—These, as well as the other Ligaments of the Liver in general, are productions of the Peritoneum.

The Ligaments of the Liver preserve it in its proper situation, and of course prevent it from inclining too much in any direction, at the same time allowing it to change place in a small degree, according to the different states of Respiration, and to the change of situation of the other Viscera near it.—The Stomach and Intestines support it when in the erect posture, and the Diaphragm when the Body is in the inverted position.

The Liver has a simple Coat adhering closely to it, which it derives from the Peritoneum, giving it a shining appearance externally. It is every where covered by this Membrane, excepting behind, where it adheres to the Diaphragm by the Cellular Texture of the Ligamentum Coronarium.

The Liver is composed of several kinds of Vessels, the extreme Branches of which are intermixed in such a manner, as to form numerous Pulpy Corpuscles, named *Acini*, from their supposed resemblance to the stones of a Grape, but which are only about the size of Mustard Seeds. These, when minutely examined, are observed to be composed of Vessels in the form of radiated *Villi* or *Penicilli*.

The *Vessels* of the Liver are, the *Hepatic Artery*, *Vena Portarum*, *Venæ Hepaticæ*, *Absorbents*, and *Biliary Ducts*.—It has likewise numerous *Nerves*.

The Trunks of the Hepatic Artery, Vena Portæ, Biliary Ducts and Nerves, with the Absorbents and Lymphatic Glands, form a large *Cord* at the under side of the Liver.

The Artery is situated in the left part of the Cord, the Vein in the right, with the common Trunk of the Biliary Ducts before it;—The Nerves, Lymphatic Vessels, and Glands, surrounding the Trunks of the Blood and Biliary Vessels.

The Cord of Vessels and Nerves is intermixed with much Cellular Substance, and covered externally by a Reflection of the Peritoneum, continued from the Omentum Minus, which has obtained the name of *Capsule of* GLISSON.

The Branches of the Vessels and Nerves accompany each other through the Substance of the Liver, forming small Fasciculi, in a manner somewhat similar to the Fasciculus of which the Cord is formed by their Trunks.

In their course through the Liver, the Branches of the different Vessels and Nerves, but particularly those of the Vena Portæ, are inclosed in a large portion of Cellular Substance, which is also frequently called *Capsule of* GLISSON, from that Author supposing it to be a continuation of the Caspule which covers the Vessels before they enter the Liver.

The *Hepatic Artery* is derived from the Cœliac, and is dispersed throughout the whole Substance of the Liver, and also upon the Coat which covers it, and is so small, when compared with the Bulk of the Liver, as to have been generally thought to be destined for the nourishment merely of that Viscus; but, from Injections passing from the Artery to the Biliary Ducts, and from other causes, it has been supposed by some Anatomists, that the Hepatic Artery is not only intended to nourish the Liver, but is capable of secreting part of the Bile;—and this supposition is farther confirmed, from the Vena Portæ having, in a recent case, been found wanting, while at the same time the Hepatic Artery was larger than usual, and the Veins, which commonly form the Vena Portæ, terminated in the Vena Cava.

The *Vena Portæ* is named from its situation with respect to the Porta of the Liver.

It partakes of the nature of an Artery and a Vein: —Like the former, it carries the Blood from the Trunk to the Branches, and, like the latter, it carries it to the Heart;—or it is peculiar in the Blood flowing in one part as in a Vein from the Branches to the Trunk, and in another, as in an Artery from the Trunk to the Branches, and performing a Secretion.

It is formed by the Veins of the Stomach and Intestines, joined to those of the Spleen, Omentum, and Pancreas, and approaches to the nature of an Artery in the thickness of its Coats, though it has no Pulsation.

It passes to the Porta, where, from its great size, which is about three times that of the corresponding Artery, it is named *Sinus Venæ Portæ*, and divides into Branches, which accompany those of the Artery in their course through the Substance of the Liver, terminating at last in the Pulpy Corpuscles.

The *Vena Portæ* serves to carry Venous Blood to the Liver, for the secretion of the Bile. It receives even the Blood which returns through the Veins of the Gall-Bladder, to assist in performing this Secretion. Some experiments seem to shew, that it may assist, in a small degree, in the nourishment of the Liver.

The *Venæ Hepaticæ* are numerous. They are reflected partly from the extremities of the Artery, and partly from those of the Vena Portæ. They unite by degrees, and accompany the other two Sets of Vessels; but, at the root of the Liver, they form two or three large Trunks which terminate in the Vena Cava, where it is about to perforate the Diaphragm. They likewise send off some small Branches which terminate in the Cava, where that Vein lies behind the Liver.

The Venæ Hepaticæ receive the Blood from the Hepatic Artery and Vena Portæ, after the Bile has been secreted, and return it to the Vena Cava, to be conveyed by it to the Heart.

The Vessels of the Liver communicate with each other in such a manner, that, after Death, a good Injection may be made to pass from the Artery into the Vena Portæ, the Venæ Hepaticæ, and Biliary Ducts, though into the last with difficulty.

The *Lymphatics* of the Liver are so numerous as to cover almost the whole of its outer Surface. See Lymphatics of Liver in Vol. III. They discharge their contents partly into the beginning of the Thoracic Duct, and partly into a Plexus situated behind the Sternum.

The *Nerves* of the Liver are also numerous. They arise from the Great Sympathetics and Eighth Pair, and accompany the Blood-vessels.

The *Biliary Ducts* arise by extremely minute Branches, termed *Pori Bilarii*, vel *Tubuli Biliferi*, chiefly from the extremities of the Vena Portæ, in the Substance of the Corpuscles, through the whole of the Liver.

The Pori Bilarii run in company with the Branches of the Artery and Veins, and unite into larger and larger Branches, which afterwards join into two, and these again into a single Trunk, called *Ductus Hepaticus*, in the Sinus Portarum.

The *Ductus Hepaticus* serves to carry the Gall or Bile from the Liver,—and to convey it, by the power of the Heart, Hepatic Artery, and Vena Portæ, assisted by the pressure of the surrounding Muscles, to the Duodenum, and partly to the Vesicula Fellis.

GALL-BLADDER.

The *Vesicula* vel *Cystis Fellis*, or *Gall-Bladder*, is a small oval or Pyriform Bag, but varying in figure and size in different individuals, and consists of a Fundus, Body, and Cervix, situated upon the concave side of the Great Lobe of the Liver, and placed in a transverse direction from behind forwards.

It extends from the Sinus Portarum, where the Cervix is situated, to the anterior edge of the Liver, and, when distended, advances beyond the edge of that Organ, so as to touch the Cartilage of the Ninth Rib, and sometimes to have its Fundus opposed to the soft parts of the Abdomen, under the edge of the False Ribs.

The Fundus, which is the larger extremity, is a little lower than the Cervix, when a Person is in the erect posture. It then also inclines a little to the right side, and rests upon the Colon at the beginning of the Duodenum.

The Gall-Bladder is composed of several *Coats*, the *external* of which is a continuation of the Membrane of the Liver. This, however, is but a partial one, covering that part of the Gall-Bladder only which is not attached to the Surface of the Liver.—It serves to give strength to the Gall-Bladder, and to fix it to the Liver.

Under the former Coat, a few pale scattered Fibres, running in various directions, are sometimes observed, which have been considered as a *Muscular Coat*; and under this there is some Cellular Substance, intermixed with a Plexus of Vessels, which has obtained the name of *Nervous Coat*.

The *Inner Coat*, sometimes called *Villous* or *Mucous*, is full of Reticular Rugæ or Folds, appearing somewhat like the cells of a honey-comb. The Cells become extremely minute towards the Cervix, where they run in a longitudinal direction.

The Surface of this Coat is every where perforated by the Ducts of small Follicles, which discharge a Viscid Mucus, to defend it from the stimulant nature of the Bile.

The Gall-Bladder is connected through its whole length to the Liver by Cellular Substance, Blood-vessels, and Absorbents, as well as by its Peritoneal Covering.

In many Brute Animals, the Gall-Bladder is connected to the Liver also by a Set of Ducts, called *Hepato-Cystic*, which convey the Bile into the Gall-Bladder immediately from the Liver. No such Ducts, however, are demonstrable in the Human Body, though, in former times, the contrary has been maintained by different Authors.

The Gall-Bladder has Blood-vessels, Absorbents, and Nerves, in common with those of the Liver.—Its Veins pass into the Vena Portæ.

The Cervix or Neck of the Gall-Bladder is twisted and folded against itself, and afterwards contracts and sends out a Duct called *Cystic*, which runs at the Right side of the *Ductus Hepaticus*, and then joins it, at a sharp Angle, to form the *Ductus Communis Choledochus*.

The *Ductus Cysticus* is smaller than the *Ductus Hepaticus*, and differs from it also in having a number of Imperfect Partitions or *Plicæ*, running in a somewhat Spiral direction, and forming it into Cells, which retard the flow of the Bile.

The Gall-Bladder serves as a receptacle for the Bile when the Stomach and Intestines are empty, and have no need of it, and retains it till wanted for the purpose of Digestion.—The Bile is afterwards discharged from the Gall-Bladder, when the Stomach is full, into the Ductus Communis, and from that to the Duodenum, chiefly by the pressure of the surrounding Viscera, and partly, as some Anatomists suppose, by a small degree of contractile power in the Gall-Bladder itself.

The whole of the Bile contained in the Gall-Bladder is found, by experiment, to pass from the Liver through the Hepatic Duct to the Ductus Communis, and from that by the Cystic Duct into the Gall-bladder.

The *Ductus Communis Choledochus* is about the size of a Goose-quill, and is considerably larger than either of the Ducts which open into it; and, like the Ductus Hepaticus, is much smoother internally than the Cystic Duct.

It descends at the posterior and left side of the first portion of the Duodenum, and, getting behind the right extremity of the Pancreas, passes for some way obliquely between the Muscular and inner Coats of that Intestine.

It terminates in the left, posterior, and nearly in the under part of the second turn of the Duodenum, by a projecting Orifice, which is rounded above, and pointed below, and which, with the obliquity of the passage of the Duct, has the effect of a Valve, in preventing the reflux of the Bile to the Liver or Gall-Bladder.

The Structure of the Ductus Choledochus, and of the Biliary Ducts in general, is of the same nature, being composed of an outer and inner Membrane. The inner Surfaces of the different Ducts also agree in being perforated by numberless Pores, which are the Mouths of Mucous Follicles, similar to those upon the inside of the Gall-Bladder.

The Ductus Communis, and Ducts which form it, are firm and strong; but in cases where their terminations are obstructed, as by Gall Stones, by Tumours, or by the want of a Gall-Bladder, they are sometimes observed greatly dilated.

The Secretion of the Bile is found, by experiment, to be constant, and to the quantity of from half a pound to a pound in the twenty-four hours, but always flowing in greatest abundance soon after taking in nourishment.

The Bile has a bitter taste, and is of a viscid consistence, of a yellowish colour changing to green, but occasionally varying a little in this respect. It is frequently of a brownish-yellow, and sometimes, especially in cases of Schirrous Liver, colourless.

The Bile returning from the Gall-Bladder, is observed, from the thinner parts being absorbed, to be more tenacious, acrid, and bitter, and of a deeper colour, than that which flows from the Liver.

According to the experiments of THENARD, one of the latest Writers on Bile, 1100 parts of this Fluid, taken from the Human Body, contain 1000 of Water, from 2 to 10 of yellow insoluble Matter, 42 of Albumen, 41 of Resin, 5.6 of Soda, 4.5 of Phosphate of Soda, Sulphate of Soda, Muriate of Soda, Phosphate of Lime, and Oxide of Iron. THENARD did not find Picromel in the Human Bile; but BERZELIUS found it in it, as well as in the Bile of an Ox.

The Bile serves to mix the different parts of the Food properly together, for the formation of the Chyle, —to combine with the excrementitious part, and prevent its absorption,—to correct too great a disposition to acidity, and to excite the Peristaltic motion of the Intestines, and thereby to facilitate the evacuation of their contents.

SPLEEN.

The *Spleen* is a soft, very Vascular Substance, and of a purple colour.

It is somewhat depressed, is of a long oval form, and of considerable size, but varying in this last respect in different subjects. Its medium length is about five or six inches; its weight, twelve or fourteen ounces.

In the upright position of the Body it is situated almost vertically, in the left Hypochondriac Region, between the large extremity of the Stomach and corresponding False Ribs;—its under end lying behind the Colon, and over the top of the Left Kidney.

The Situation of the Spleen varies a little, according to the state of Respiration, and to the fulness of the Stomach;—rising or falling as the Lungs are less or more dilated,—and becoming more oblique in its situation, with its inferior extremity turned more forwards, in proportion as the Stomach becomes more distended. Its form and size also vary a little, according to the degree of pressure it receives from the Stomach.

Its *External Surface* is convex, and uniform, corresponding with the Surface of the Ribs, &c. to which it is opposed.

Its *Internal Surface*, or that next the Spine, is irregularly concave, and is divided into an Anterior and a Posterior Plane, by a Longitudinal Groove or Fissure, where the Vessels and Nerves enter.

The Anterior Plane is more concave than the Posterior, corresponding to the contiguous convexity of the Stomach, with which it is in close contact.

The Spleen has frequently deep *Fissures* upon its edges;—sometimes it has small *Appendages* attached to it, and not unfrequently there is one or more *Spleens*, though very small, connected with it.

At the inner side, it is fixed to the Omentum, and by means of that and Blood-vessels, to the Stomach and Pancreas. Behind, it is connected to the Diaphragm, and below, to the Left Kidney and Colon, by Reflections of the Peritoneum, and by Cellular Substance.

It is covered by a *double Membrane*, one Layer of which is a production of the Peritoneum, the other proper to the Spleen itself, but so closely connected to the Common Coat, that they appear in the Adult Body to be one and the same Membrane.

The Substance of the Spleen is remarkably soft, and is by much the most tender of the Abdominal Viscera.

It consists of a Congeries of Blood-vessels, Lymphatics, and Nerves, joined together and supported by a large quantity of Cellular Substance.

The extreme Branches of the Blood-vessels put on the appearance of *Penicilli*, which have been mistaken for Glands.

These Vessels are so tender, that when an injection is forcibly thrown either into Artery or Vein, particularly the latter, it bursts into the common Cellular Substance, and gives the appearance of Follicles or Cells; and such were described by MALPIGHI as existing naturally between the extremities of the Artery, and beginnings of the Veins.

The *Blood-vessels* of the Spleen are among the largest of the Body, in proportion to the size of the Viscus in which they are dispersed.

The *Artery* is a principal Branch of the Cœliac.—It runs in a serpentine direction, which lessens the force of the Blood sent to this tender Organ. After sending Branches to the Pancreas, &c. and the *Arteriæ Breves* to the left end of the Stomach, it goes into the Substance of the Spleen, where it is subdivided into Branches, which are crowded together, and run in every direction, forming at length Plexus and Penicilli, which terminate in the Branches of the corresponding Vein.

The *Vein*, like that in most other Viscera, is larger than the Artery: It receives the Blood immediately from the terminations of the Artery, without the intervention of Cells.

The Splenic Vein receives the *Venæ Breves* of the Stomach, the Pancreatic Veins, &c. and forms one of the principal Branches of the Vena Portæ.

The *Lymphatics* from the superficial parts of the Spleen join the deep-seated Absorbents at the Fissure where the Blood-vessels enter, and afterwards pass through several Conglobate Glands lying over the Splenic Artery.

They intermix with Lymphatics belonging to several other Viscera, and terminate in the Thoracic Duct.

The *Nerves* of the Spleen, which are small, but considerable in number, are Branches of the Great Sympathetic and Eighth Pair, and form an irregular Plexus which surrounds the Vessels.

No Excretory Duct has been found to proceed from the Spleen, in consequence of which very various hypotheses have been entertained with respect to the Use of this Organ.

Many of the Ancients were of opinion,—that besides the Bile of the Liver, there was an *Atra Bilis*, or *Black Bile*, and that the Spleen was the receptacle of it.

Others have thought that a particular *Menstruum* was secreted in it, and conveyed to the Stomach for the purpose of Digestion.

Others again,—that the Blood of the Spleen promotes the sluggish circulation of the Blood of the Vena Portæ.

The late MR HEWSON, who has written particularly on this Viscus, was of opinion, that it concurred with the Thymus and Lymphatic Glands in forming the red Globules of the Blood, and that these Globules were rendered complete in the Spleen.

It has been also supposed,—that as the Stomach becomes full, the Spleen is compressed by it, in consequence of which a greater quantity of Blood is sent to the Pancreas, for the secretion of the Pancreatic Juice.

But the present most prevalent opinion is,—that the Blood undergoes some change in it, which renders it useful in the Secretion of the Bile, and this opinion is supported from the great quantity of Blood with which this Organ is known to be supplied, and from its Vein, not only in Man, but in other Animals, passing to the Vena Portæ. A late opinion is, that the Spleen forms the oleaginous part of the Bile.

PANCREAS.

The *Pancreas* is a Gland of the Conglomerate kind, from six to eight inches in length, an inch and a half in breadth; is flattened at its anterior and posterior parts, and is of the same nature with the Salivary Glands, of which it may be reckoned the largest.

It is situated in the Epigastric Region, and is placed transversely in the back part of the Abdomen, between the Stomach and Spine.

It has a large or Right Extremity, and a small or Left one, an Anterior and a Posterior Surface, and an Upper and Under Edge.

The Right Extremity is attached to the left side of the second turn of the Duodenum, or to that part where the Intestine is about to go across the Spine.

From the under part of the Right Extremity, the Pancreas sends down an Elongation or Process, which adheres closely to the Duodenum.

This Process was discovered by Winslow, and termed by him *Pancreas Minus.*—It is also called *Head of the Pancreas.*

The Pancreas passes before the upper edge of the transverse portion of the Duodenum, and over the Aorta, Vena Cava, and part of the Splenic Vessels, to all of which it is attached.

It becomes gradually narrower and thinner towards its Left Extremity, which is rounded, and is fixed to the Spleen, through the medium of the Large Omentum.

The Pancreas is covered anteriorly by the two Layers of the root of the Meso-colon, which assist in retaining it in its place;—posteriorly, it is only covered by Cellular Substance, which connects it to the Vertebræ.

It is of a pale red colour, bordering upon yellow, and is composed of minute Granulæ termed its Acini, which form small Glands or Lobes, that are connected loosely by Cellular Texture, in such a manner as to give an appearance of uniformity and smoothness to its External Surface.

By a good Injection, each of the Acini is found to be composed of an assemblage of Blood-vessels, and of the origins of Excretory Tubes.

The *Arteries* of the Pancreas are derived, partly from the Hepatic, but chiefly from the Splenic, by several small Branches, which pass at various places into its Substance, in a transverse direction.

The *Veins* correspond in name and general course with the Arteries, and assist in forming the Vena Portæ.

The *Lymphatics* run to the Splenic Plexus, and terminate in the Thoracic Duct.

The *Nerves* of the Pancreas are small. Like those of the other Viscera of the Abdomen, they are derived from the Great Sympathetic and Eighth Pairs.

From the different Acini of the Pancreas, small Ducts arise, which join into larger ones, running transversely in the Substance of the Pancreas, nearly in the same Plane, and forming a common Duct, called *Ductus Pancreaticus.*

The *Pancreatic Duct,* termed also *Ductus* WIRTSUNGI, after the Discoverer of it in the Human Body, is remarkably thin in its Coats, of a white colour, and semi-transparent.

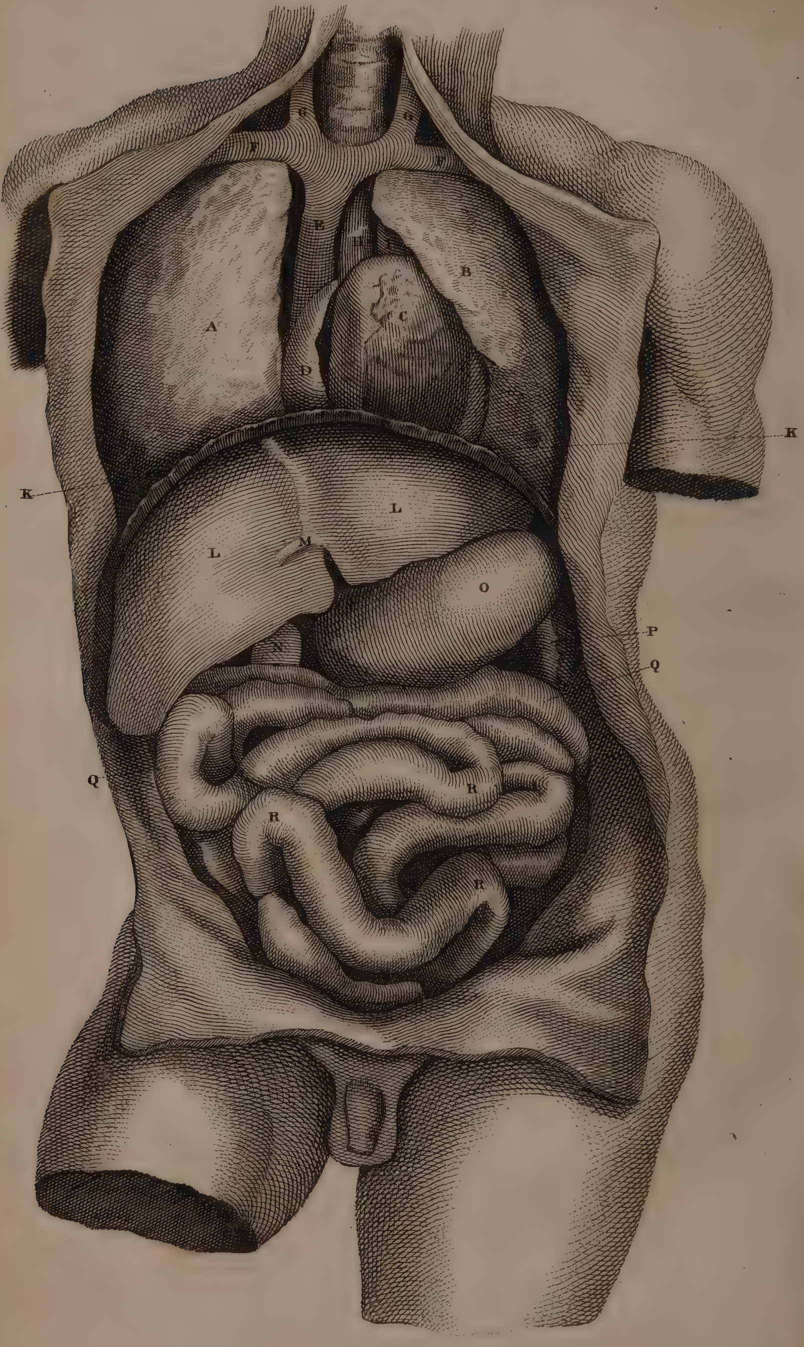
It begins at the Left Extremity of the Pancreas, runs somewhat Serpentine in the Substance of the Gland, a little below its middle height, becoming gradually larger in consequence of receiving the different Branches which compose it,—and is at last somewhat larger than a Raven's Quill.

At the Right Extremity of the Pancreas, it receives the principal Duct of the Pancreas Minus, and terminates obliquely in the Duodenum by an Orifice common to it and the Ductus Communis Choledochus.—In some rare cases, however, it terminates at a little distance from the Biliary Duct; and sometimes also the Duct of the Pancreas Minus ends separately in the Duodenum.

The Pancreas secretes a *Liquid*, (to the nature of which no great attention has been paid), but it resembles the Saliva in quality and appearance, and discharges it by its excretory Duct into the Duodenum.

The *Pancreatic Juice* incorporates the Bile with the Alimentary Mass, blunts the Acrimony of these, or of Acids which may be formed in the Canal, and may be said also to answer some of the purposes to the Contents of the Intestines, which the Gastric Juice does to those of the Stomach; or, it finishes that Digestive Process in the Intestines, which was begun in the Stomach.

TAB XXIV.



E. Mitchell Sculp.t

TABLE XXIV.

Gives a Front View of the Contents of the Thorax and Abdomen, after removing the Parts which cover them.

A, The right lung, part of which is cut off, to shew large blood-vessels.
B, The left lung.
C, The right ventricle of the heart, with the point of the left ventricle.
D, The right auricle of the heart.
E, The vena cava superior.
F, F, The subclavian veins.
G, G, The internal jugular veins.
H, The aorta ascendens.
I, The pulmonary artery.
K, K, The diaphragm.
L, L, The right and left lobes of the liver, with the vestige of the ligamentum latum between them.
M, The ligamentum rotundum.
N, The fundus of the gall-bladder.
O, The stomach, pressed by the liver towards the left side.
P, The spleen.
Q, Q, The situation of the kidneys behind the intestines.
R, R, R, The convolutions of the small intestines.

TABLE XXV.

Represents the Cavities of the Heart laid open, to shew its Internal Structure.

FIG. 1.

A view of the Cavity *of the* Right Auricle, *laid open Anteriorly.*

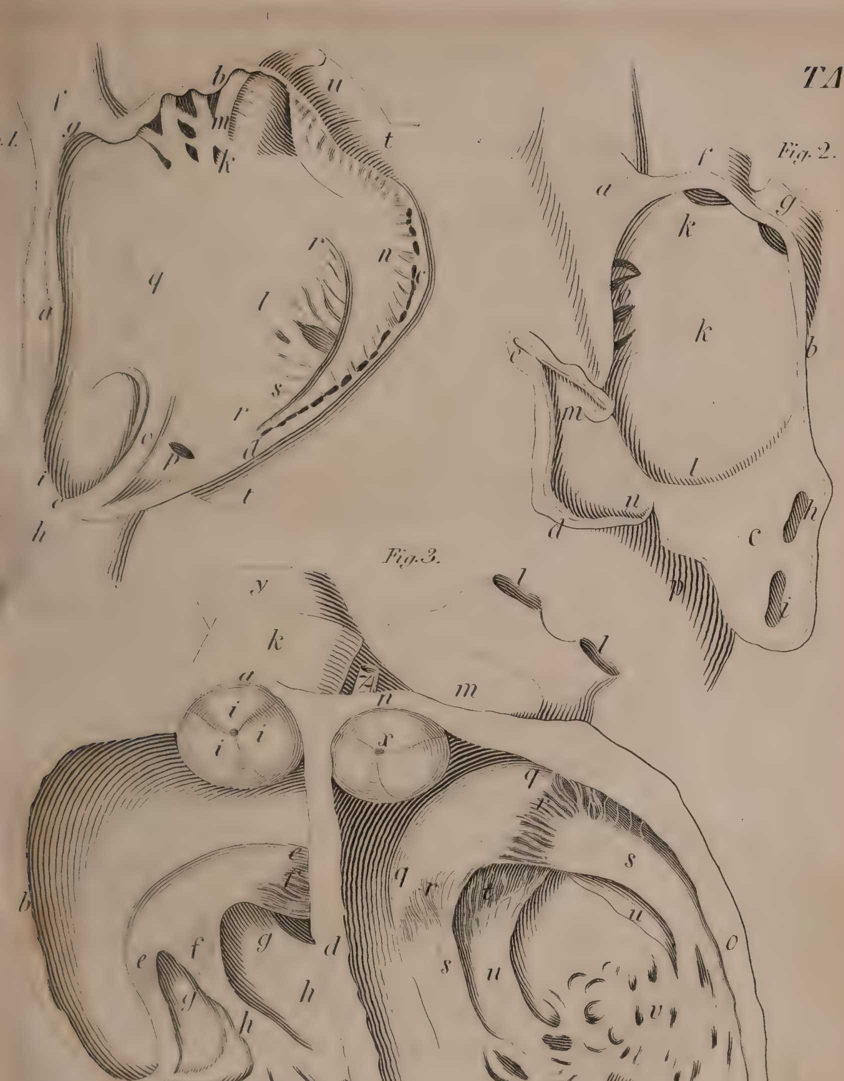
a, b, c, d, e, The cut edge of the right auricle.
f, The vena cava superior.
g, The termination of this vein in the right auricle.
h, i, The vena cava inferior;—*i,* its mouth.
k, The boundary between the right venous sinus and proper auricle.
l, The boundary between the sinus and right ventricle.
m, n, Fleshy pillars within the auricle, called *Musculi Pectinati.*
o, o, The *Valve* of Eustachius.
p, The valve at the mouth of the coronary vein.
q, The vestige of the foramen ovale.
r, r, A tendinous circle, giving origin to the valvula tricuspis.
s, s, Are placed upon the valvula tricuspis, and in the opening between the auricle and its corresponding ventricle.
t, t, The beginning of the right ventricle.
u, The pulmonary artery.

FIG. 2.

Represents the Cavity *of the* Left Auricle.

a, b, The cut edge of the left venous sinus.

TAB. XXV.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c, Part of the sinus cut and turned down.

d, *e*, The proper auricle laid open on its posterior and left side.

f, *g*, The termination of the superior and inferior pulmonary veins of the right side.

h, *i*, The orifices of the superior and inferior pulmonary veins of the left side.

k, *k*, *l*, The inner surface of the sinus, which is smooth and uniform.

m, *n*, The cavity of the proper auricle, with its columnæ carneæ.

o, The beginning of the valvula mitralis, and opening of the auricle into the corresponding ventricle.

p, Part of the left ventricle.

q, The vena cava superior.

FIG. 3.

The VENTRICLES *laid open at their Fore and Left Side, a Portion of the* SEPTUM *removed, and the* HEART *turned obliquely forwards and to the Right Side, to exhibit the* VALVES *of the* VENTRICLES *and* ARTERIES, *with their Relative Situations.*

a, *b*, *c*, *d*, The cavity and cut edge of the right ventricle. —*c*, A thick fleshy part of the ventricle.—*d*, *d*, The partition between the right and left ventricle.

e, *e*, The fore part of the circular membrane of the tricuspid valve.

f, *f*, *f*, Tendinous cords from the fore part of the tricuspid valve.

g, *g*, Tendinous cords from the back part of the tricuspid valve, lying flat upon the sides of the ventricle.

h, *h*, Fleshy columns fixing the valve to the side of the ventricle.

i, *i*, *i*, The semilunar valves at the mouth of the pulmonary artery, with their corpuscula.

k, The trunk of the pulmonary artery.

l, *l*, The left pulmonary veins.

m, Part of the left auricle.

n, *o*, *p*, The cut edge of the left ventricle.

q, *q*, The circular membrane which forms the valvula mitralis.

r, *r*, Tendinous cords sent off from the valve.

s, *s*, Columnæ carneæ, fixing the valve to the side of the ventricle.

t, Tendinous cords from the back part of the valve, resting upon the side of the ventricle.

u, *u*, Fleshy columns fixing the tendinous cords of the back part of the valve to the side of the ventricle.

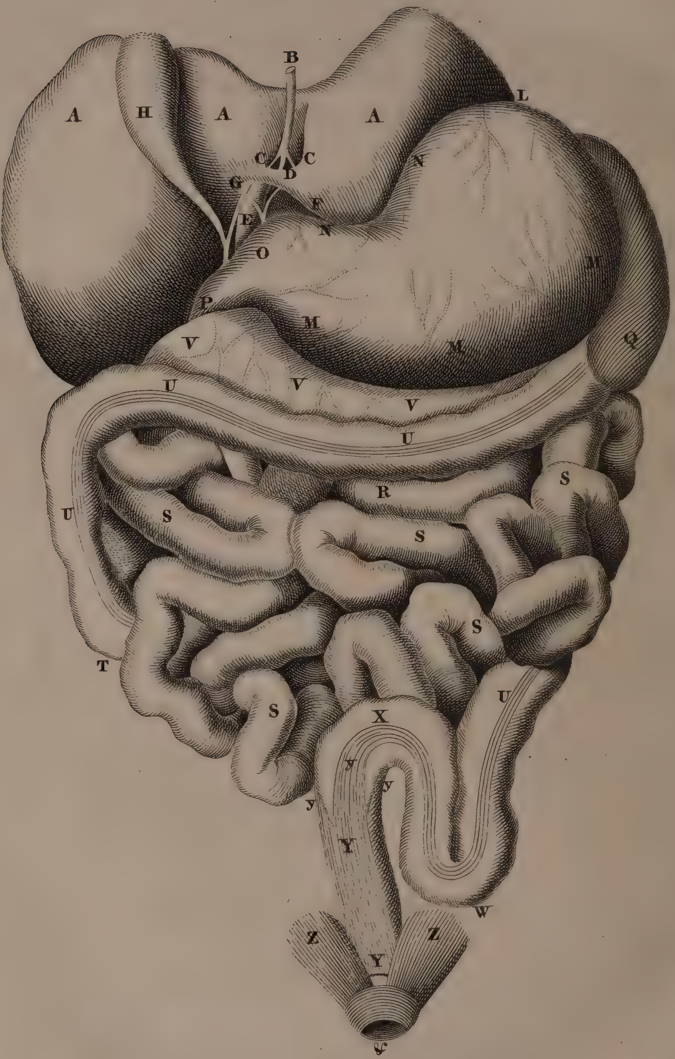
v, *v*, A few of the many fleshy columns and foveæ represented, with which the side or wall of the ventricle abounds.

x, The semilunar valves at the mouth of the aorta.

y, The aorta.

z, The origin of one of the coronary arteries of the heart from the beginning of the aorta.

TAB. XXVII.



W. Archibald

TABLE XXVI.

REPRESENTS the CHYLOPOIETIC and ASSISTANT CHYLOPOIETIC VISCERA, removed from the BODY.

A, A, A, The concave part of the liver turned up.
B, The ligamentum rotundum.
C, C, Its passage under,
D, The isthmus of the liver.
E, The vena portæ.
F, The arteria hepatica.
G, The ductus hepaticus.
H, The gall-bladder.
I, The ductus cysticus.
K, The ductus communis choledochus. The rest of the viscera are placed in the same manner as when in the body.
L, The great, or left extremity of the stomach.
M, M, M, The great curvature of the stomach, and gastro-epiploic vessels, the branches of which are represented too large.
N, N, The small curvature of the stomach.
O, The small extremity of the stomach, and seat of the pylorus.
P, The duodenum.
Q, The spleen.
R, S, S, &c. The convolutions of the jejunum and ilium.
T, The intestinum cæcum.
U, U, &c. The colon, along which one of its muscular ligaments is seen.
V, V, V, The mesocolon, with its blood-vessels and glands.

TABLE XXVI. CONTINUED.

W, X, The sigmoid flexure of the colon, with the muscular ligament continued.

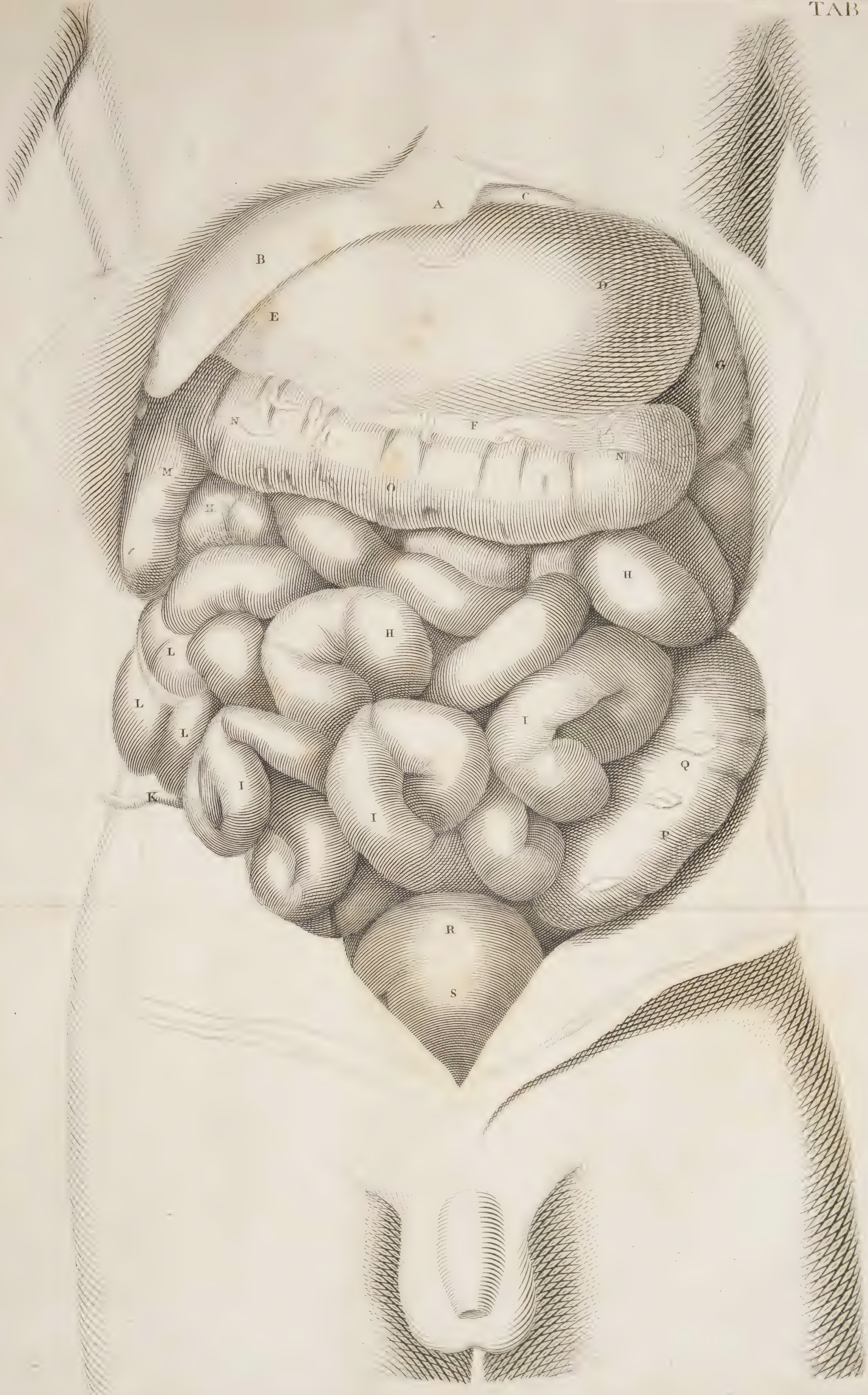
Y, Y, The intestinum rectum.

y, *y*, *y*, The three ligaments of the colon expanding upon the rectum.

Z, Z, The levatores ani.

&, The anus, surrounded by the sphincter ani.

The white spot above the sphincter ani points out the seat of the prostate gland.


A
C
B
D
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G
N
F
N
M
O
H
H
H
L
L
L
I
Q
K
I
I
P
R
S

TABLE XXVII.

A VIEW of the ABDOMINAL VISCERA of a YOUNG ADULT, who suffered a Violent Death during the Summer of 1812.—The parts are in the perfectly sound State, and the natural Situation is preserved as much as circumstances would allow. A CRUCIAL INCISION is made through the INTEGUMENTS, MUSCLES, and PERITONEUM, and the Flaps turned back. The Fore part of the FALSE RIBS is cut and removed, and their remaining Portions gently drawn outward, to obtain a more complete VIEW of the VISCERA at the upper end of the ABDOMEN. The STOMACH and INTESTINES are slightly distended, by Air blown in at the ESOPHAGUS.

A, The outlines of the cartilago ensiformis.

B, C, A portion of the upper convex part of the liver; B, the right; and C, the left lobe.

D, E, The stomach, lying nearly in the horizontal situation; D, the great; E, the small extremity.

F, A portion of the omentum majus, the rest of it being separated, to give a view of the parts which it covered.

G, The spleen, brought a little forward from its natural situation.

H, H, H, The convolutions of the jejunum.

I, I, I, Those of the ilium.

K, The appendix vermiformis pulled outward.

L, L, L, The intestinum cæcum, with one of its longitudinal muscular bands.

M, The right portion of the colon.

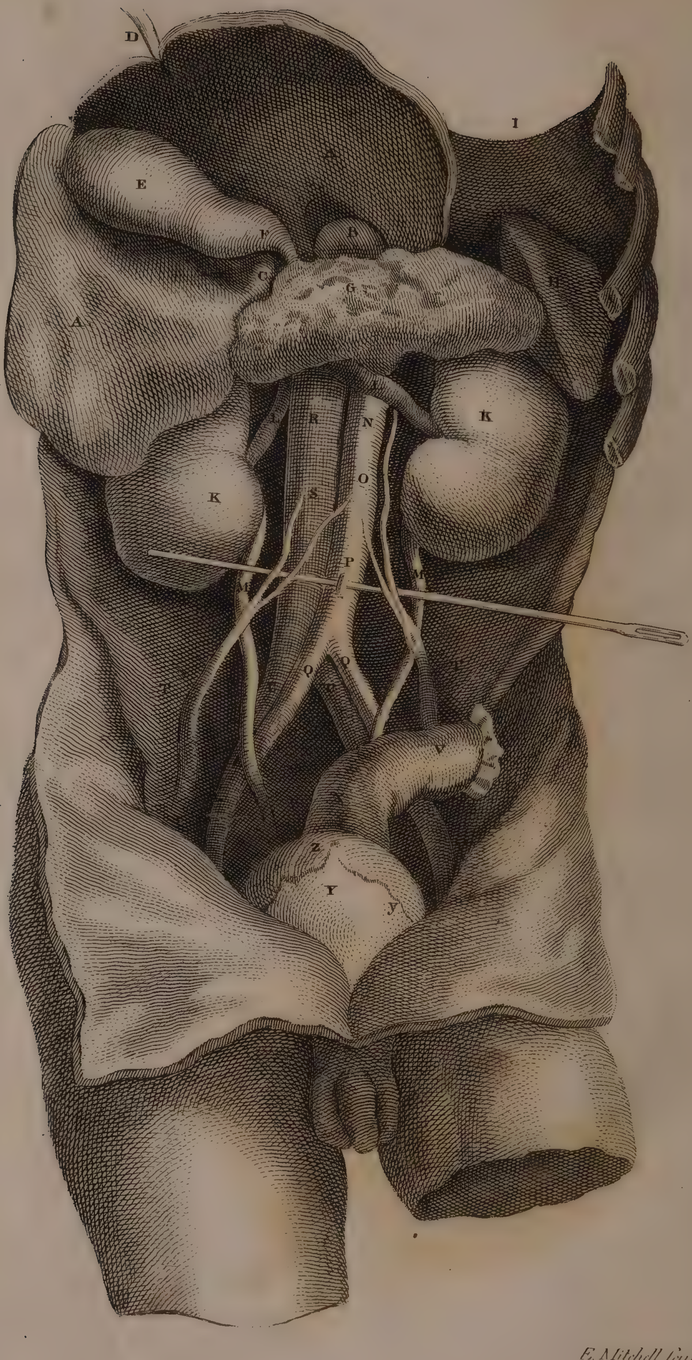
N, N, The great arch of the colon, with its appendiculæ pinguedinosæ.

O, One of the longitudinal muscular bands of the colon, tucking it up into cells.

P, The sigmoid flexure of the colon, with its fatty appendages.

Q, One of the bands of the sigmoid flexure.

R, S, The bladder of urine distended. R, shews how far the peritoneal coat descends on the fore part of that viscus; S, the muscular coat of the bladder.



E. Mitchell sculp.t

TABLE XXVIII.

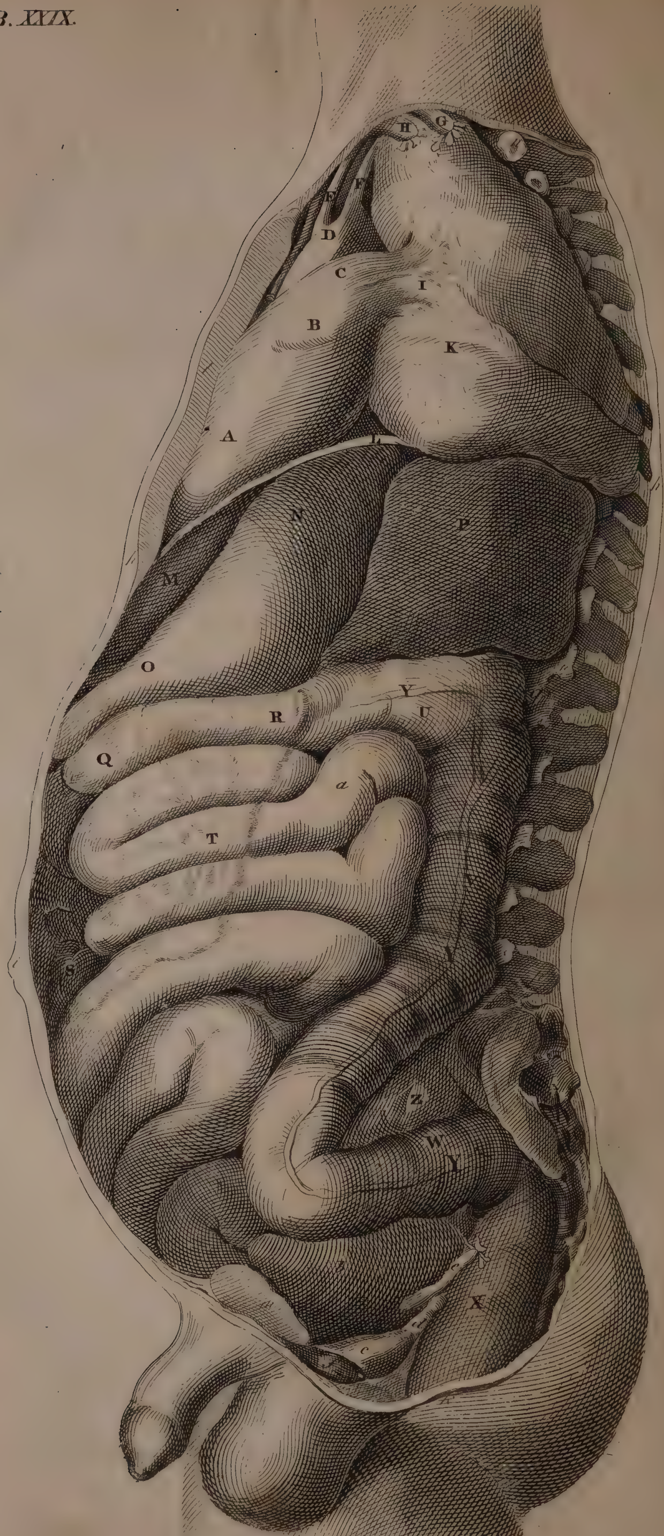
EXHIBITS the VISCERA in the Upper, Back, and Under Parts of the ABDOMEN.

A, A, The hollow, or inferior surface of the liver, turned upwards and to the right side.
B, The lobulus SPIGELII.—Between B and C, The porta.
D, The ligamentum rotundum.
E, The gall-bladder.
F, The beginning of the cystic duct.
G, The pancreas.
H, The spleen.
I, The ribs.
K, K, The kidneys.
L, L, The renal veins.
M, M, The ureters.
N, The aorta.
O, The spermatic arteries.
P, The beginning of the inferior mesenteric artery.
Q, Q, The common iliac arteries.
R, The inferior vena cava.
S, s, The spermatic veins.
T, T, The spermatic arteries and veins, closely embracing each other, in their way to the testes.
U, U, The common iliac veins.
V, The end of the colon.
X, The beginning of the rectum.
Y, y, y, The bladder of urine.

Y, That part of the bladder which is covered only by cellular substance.

y, *y*, *z*, Shews how far the peritoneum reaches down upon the fore part of the bladder, when this viscus is moderately distended.

Z, The urachus.


H
G
F
E
D
C
I
B
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A
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M
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Y
R
U
Q
a
T
V
S
Z
W
Y
b
c
X
c
c

TABLE XXIX.

The THORACIC and ABDOMINAL VISCERA, seen from the Left Side.

The Lateral Portion of the Diaphragm over the Liver, Stomach, and Spleen, is cut off. The Left Lung is turned towards the Spine, that its concave Surface, which accommodates itself to the Pericardium, the bare Surface of the latter, and the Vessels proceeding from the Heart, may appear. The Kidney is raised from its place. The Iliac and Spermatic Vessels, the Ureter and Sciatic Nerve, and the Peritoneum covering this side of the Intestines, are dissected away, by which the Intestines and Omentum are brought into view.

A, B, C, The pericardium, containing the heart and origins of the vessels ;—A, the apex and left ventricle of the heart appearing through the pericardium ;—B, the left auricle also somewhat conspicuous ;—C, the pulmonary artery.

D, The arch of the aorta, after emerging from the pericardium.

E, The arteria innominata LOWERI, and,

F, The left carotid artery arising from the aorta.

G, H, The arteria and vena subclavia.

I, One of the four pulmonary vessels which terminate in the left auricle of the heart.

K, The left lung turned towards the spine in such a manner, that what is naturally concave and embracing the pericardium, appears here convex.

L, A portion of the diaphragm left *in situ*, after removing its lateral part; shewing how far it ascends into the cavity of the thorax.

M, The left part of the liver lying over the stomach.

N, O, The stomach a little distended with aliment;—N, the saccus cæcus, vel fundus ventriculi;—O, the great arch or curvature.

P, The spleen, the figure of which in this subject was almost quadrangular. It is convex externally, and concave internally where it is accurately applied to the stomach.

Q, R, S, T, The omentum majus; S, T, that part of it called the gastro-colicum, descending from the great arches to the stomach and colon over the small intestines,—very thin and without fat.

Q, R, U, V, V, W, X, The great intestines;—Q, R, U, the transverse part of the great intestine, termed *colon transversum*, and *zona coli*, running under the stomach and spleen to the transverse processes of the last vertebra of the back, and first of the loins;—V, V, the left part of the great intestine, or the *colon sinistrum*, descending near the lumbar vertebræ and os ilium;—W, the inferior part of the colon sinistrum, or the bottom of the sigmoid flexure, ascending a little, and reaching the middle of the upper part of the os sacrum;—X, the extremity of the colon termed *rectum*, proceeding along the os sacrum and os coccygis to the anus.

Y, Y, Y, One of the three ligaments which extend along the colon, from the intestinum cæcum as far as the beginning of the rectum.

Z, Part of the meso-colon through which the small intestines appear.

S, T, *a*, *a*, The convolutions of the small intestines partly covered by the omentum.

b, The vesica urinaria somewhat distended with fluid, placed between the ossa pubis and intestinum rectum.

c, The prostate gland, situated at the lower part of the bladder of urine.

d, The vesicula seminalis of the left side.

e, The ureter dissected a little from the bladder.

f, The left crus penis separated from the corresponding crus of the os ischium.

g, The place which the kidney of this side occupied, partly filled by the colon, though the true situation of it still appears.

OF THE

ORGANS OF URINE AND GENERATION IN THE MALE.

KIDNEYS.

THE *Kidneys* are two Glandular Bodies of a pale red colour, situated in the upper and back part of the Abdomen, in the Lumbar Region.

They are placed one on each side of the Spine, extending from the eleventh pair of Ribs to near the Crista of the Ossa Ilia, and rest upon the Diaphragm, large Psoæ, Quadrati Lumborum, and Transversales Abdominis.

The Right Kidney is situated at the under and back part of the large Lobe of the Liver, behind the Colon, and is commonly a very little lower than the Left, being supposed to be affected by the Great Lobe of the Liver.

The Left Kidney is placed at the under and back part of the Spleen, and behind the left portions of the Stomach, Pancreas, and Colon.

The Kidney is between four and five inches in length, but considerably less from the outer to the inner side, and less still from before backwards; or, it is compared in shape to a *French* or *Kidney Bean.*

It is rounded anteriorly, flattened posteriorly, convex and uniform in its outer margin, and has a deep Depression or Sinus towards the Vertebræ, surrounded with unequal edges, where the Renal Vessels and Nerves enter.

It is a little broader behind than before, and a little broader and more curved above than below; from which circumstances, but more particularly from the disposition of the Vessels, to be afterwards mentioned, it is easy to distinguish the Right from the Left Kidney when taken out of the Body.

The Right Kidney is connected to the Liver and Duodenum, the Left to the Spleen, and both to the Muscles on which they are placed, and to the Renal Glands and Colon, by Cellular Substance, and by the Peritoneum; which last, reflected from the Liver and Spleen to the Kidneys, have by some been called the *Ligaments of the Kidneys.*

They are also connected to the Aorta and Vena Cava by their Blood-vessels, and to the Bladder of Urine by the Ureters.—They accompany the motion of the Liver and Spleen in the different states of Respiration.

Each Kidney is surrounded by loose Cellular Substance, which commonly contains a considerable quantity of Fat, and has therefore got the name of *Tunica Adiposa.*

The *Tunica Adiposa* covers not only the Kidney, but the large Vessels, and defends them from the pressure of the surrounding Viscera.

Under the Tunica Adiposa, there is a *Membrane*, composed of the original proper Coat and Cellular Texture incorporated, which adheres closely to the Kidney, and is reflected over the edges of the Sinus, to be joined to the Pelvis and large Vessels.

The surface of the Kidney is commonly smooth and uniform, though sometimes it is irregular, in consequence of the Lobes which originally formed it not being completely incorporated. It consists of an outer part called *Cortical*, and an inner termed *Medullary*.

The *Cortical Substance*, termed also *Secerning*, surrounds the Kidney, and is about a fourth or third part of an inch in thickness.—It likewise sends in partitions which separate the Medullary parts from each other.

The *Medullary*, termed also *Tubular* or *Uriniferous Substance*, is more compact and of a paler colour than the former, and is divided into a number of distinct Columns, each of which terminates in a Projection called *Papilla*, vel *Processus Mammillaris*.

The *Papillæ* are merely the continuation of the Uriniferous part, though frequently considered as a third division of the Substance of the Kidney.

Each Kidney has one, and sometimes more *Arteries*, of great proportional size, which run transversely from the Aorta, and a *Vein* still larger than the Artery, which terminates in the Cava.—They enter at the Sinus of the Kidney, and are included in Cellular Substance, which accompanies them throughout their course.

The Right Renal Artery is longer than the Left, in consequence of the Vena Cava, behind which it passes, being placed upon the right side of the Aorta.

The Artery, as it approaches the Kidney, is divided into Branches, which are afterwards minutely distributed through the Cortical Substance, forming Arches and Anastomoses; but these are found to be much less frequent than are commonly described; for a fine Injection thrown into a Branch of the Artery, fills only the Ramifications belonging to that Branch.

The small Branches, after turning and winding in various directions, pass partly towards the Surface of the Kidney, where they form irregular *Stars*, some of which supply the proper Membrane.

Others turn inwards in a waving direction, and form *Corpuscles*, or *Acini*, disposed somewhat after the manner of *Clusters of small Berries*, which can only be seen distinctly by the assistance of Glasses, after a minute Injection.

The *Corpuscles* were considered by DR NICHOLS, as the Globular terminations of Blood-vessels, and called by him *Globuli Arteriarum Termini;* but these Globuli were afterwards observed by MR HEWSON, and others, to consist of small Vessels intimately intermixed.

A fine Injection thrown into the Artery sometimes appears to fill the Uriniferous Tubes, and thereby to imitate the secretion of the Urine; but this experiment is more readily performed in some of the Brute Creation, as the Horse, where the structure of the Kidney seems to be more simple than in Man.

The *Veins* returning from the extremities of the Arteries, unite in the Cortical Substance of the Kidney.

The Branches of the Renal Vein communicate freely, especially on the Surface of the Kidney. They are much larger than those of the Artery, but correspond with them in their course.—They form a large Trunk on each side, which lies anterior to the corresponding Artery, and runs transversely to the Cava; the left, which is the longer, passing across the fore part of the Aorta.

The *Lymphatics* of the Kidney run from without inwards, and terminate in the Lumbar Glands, and afterwards in the Thoracic Duct.—The Superficial Lymphatics are so small as seldom to be seen, excepting in the diseased state of this Organ.

The *Nerves* are from the Semilunar Ganglion, formed by the Great Sympathetic and Eighth Pairs. They compose a Plexus which surrounds the Blood-vessels, and accompanies them in the Kidney.

From the minute extremities of the Renal Artery, in the Corpuscles situated in the Cortical Substance, the *Uriniferous Tubes* arise. They are mixed with some extremely small Blood-vessels, and constitute the Medullary Substance of the Kidney.

By degrees they unite into larger Tubes, which run in a radiated manner, the direction being from the outer edge or circumference, towards the Sinus or inner part of the Kidney.

The radiated Tubes, becoming still larger in their passage, terminate in the *Papillæ*, which are of a compressed conical form, and at a little distance from each other.

The *Papillæ* are twelve or more in each Kidney, the number varying according to that of the original Lobes of which the Kidney is composed, and likewise from some of the Papillæ being occasionally incorporated with each other.

Upon the Points of the Papillæ are the Terminations of the Uriniferous Tubes,—large enough to be distinguished by the naked Eye,—through which the Urine distils from the Substance of the Kidney.

Round the root of each Papilla, a Membranous Tube arises, termed *Infundibulum* or *Calix*, which receives the Urine from the Papilla.

The *Infundibula* are commonly the same in number with the Papillæ; the number, however, varying in different Subjects, two or more of the Papillæ sometimes opening into the same Infundibulum.

The Infundibula join into two or three large Trunks, at the Sinus of the Kidney, which afterwards form a Dilatation of considerable size, of the shape of an inverted Cone, and termed *Pelvis* of the Kidney.

The *Pelvis* is placed between the principal Branches of the Renal Artery and Vein, partly within, but the greater part of it without the Body of the Kidney, and contracts into a long Tube, about the size of a Goose-quill, called *Ureter*.

URETERS.

The *Ureters* are commonly one to each Kidney, though in some rare instances they are double on one or on both sides.

The Artery of the Kidney is placed uppermost,—the Vein in the middle and fore part,—and the continuation of the Pelvis and beginning of the Ureter at the under and back part of the Blood-vessels; which disposition of the Vessels serves as a distinguishing mark between the Right and Left Kidney, when separated from the Body.

The Ureters descend in the Loins obliquely inwards behind the Peritoneum, and go over the Psoæ and Iliac Vessels, opposite to the anterior and lateral part of the Os Sacrum.

They pass afterwards into the Pelvis, and terminate obliquely in the under, outer, and back part of the Bladder.

In their descent, they do not run in a straight, but in a waving direction, somewhat similar to the Italic *ſ*,—neither are they cylindrical, as they form slight dilatations and contractions in their course, two of which contractions are more observable in their passage over the Psoæ Muscles, and at their insertion into the Bladder.

The Ureters are covered anteriorly by the Peritoneum, and composed of an *External Membranous Coat*, a *Middle Muscular* one, formed chiefly of Circular Fibres, and an *Internal Coat*, sometimes called *Villous*, but which is a real Mucous Membrane.

The Inner Coat is very Vascular, and is perforated by the Mouths of small Ducts, which line it with a Mucus to defend it from the Urine.

The Vessels and Nerves of the Ureters are from those of the contiguous parts.

The Kidneys secrete the Urine from the Blood, and convey it by means of Ureters to the Bladder.

RENAL GLANDS.

The *Renal Glands*, termed also *Capsulæ Atrabilariæ*, *Capsulæ Renales*, *Renes Succenturiati*, and *Glandulæ Supra-Renales*, are two small, flat, Glandular-like Bodies, of a dark yellow colour, lying in the upper and back part of the Abdomen.

They are situated at the upper, inner, and fore part of the Kidneys, having a concavity which corresponds with the rounded edges of these Organs. They lie over the large Psoæ Muscles and Diaphragm, and higher than the Renal Vessels.

They are of an irregular figure, somewhat triangular, and are about a couple of inches in length, but much larger proportionally in a Fœtus than in an Adult; in the latter case being only about a fifteenth part of the size of the Kidney.

The right one is connected to the Liver, the left to the Spleen and Pancreas, and both to the small Muscle of the Diaphragm, and to the Psoæ Muscles and Kidney, by Cellular Substance. They are likewise retained in their place by numerous Vessels and Nerves which are spread over them.

They are surrounded by Cellular Texture, which is part of the Tunica Adiposa of the Kidneys, and have a thin proper Coat, which adheres firmly to them.

Their inner parts are softer than the outer, are of a brown colour, and can be easily separated from the outer, after which the Glands have the appearance of being real Capsules. They are frequently observed to be hollow, and to contain a dark-coloured Bilious-like matter, which is considered by many Anatomists as the Internal very Vascular and tender parts melted down by Putrefaction.

Their *Arteries* come from those of the adjacent parts, particularly from the Renal, and also from the Aorta and Diaphragmatic Arteries.

Of the principal *Veins*, the Right goes to the Vena Cava, and the Left to the Renal Vein.

The *Lymphatics* go chiefly to those of the Kidneys.

The *Nerves* come principally from the Renal Plexus.

No Excretory Ducts have been discovered to belong to them.

The Renal Glands have been supposed to furnish Lymph for the dilution of the Blood returning in the Renal Veins, after the secretion of the Urine;

Or, to restore to the Blood of the Vena Cava, the irritable parts lost in the secretion of the Urine and Bile: Or, to convey something useful to the Thoracic Duct: Or, in a Fœtus, to divert the Blood from the Kidneys, and thereby lessen the quantity of Urine.

But their use is still undiscovered; though it is supposed, from their vicinity to the Kidneys, not only in Man, but in many other Animals, that they are subservient to these Organs, particularly in the Fœtus; yet in one case, where the Kidneys were placed much lower than usual, the Renal Glands were observed by the Author to have their ordinary situation in the Abdomen.

VESICA URINARIA.

The *Vesica Urinaria*, or *Bladder of Urine*, is a large Musculo-membranous Sac situated in the Pelvis, in the bottom of the Hypogastric Region.

It is placed in the Fore Part of the Pelvis, behind the Ossa Pubis,—before the upper, and above the under portion of the Intestinum Rectum.

When completely empty, as is sometimes the case, but by no means always, in those who have suffered a violent death from suspension by the Neck, it is contracted into a small size; is then somewhat triangular, but rounded at the corners; occupies only the under and fore part of the Pelvis; when moderately distended, it is still contained in that Cavity; but, when much dilated, it rises above the Ossa Pubis, and sometimes, as in a retention of Urine, ascends to within a little distance of the Umbilicus. It then almost completely fills the Cavity of the Pelvis, especially if the Rectum be empty.

When moderately dilated, it is of a roundish, or irregular oblong form, but a little flattened before, more convex behind, and broader at its anterior and posterior than towards its lateral parts,—a little more capacious, also, below than above, especially at its posterior part.

In People advanced in life, and of a relaxed habit, the Bladder is sometimes divided at its under part, into two Lateral Portions, in which Calculi are occasionally lodged.

The Bladder is distinguished into *Fundus*, *Body*, and *Cervix*; the first of which is placed upwards and a little forwards, and the last at the under and fore part.

It is connected below to the Rectum, and at the sides to the Pelvis, by the reflected Peritoneum and Cellular Substance; the former of which, when the Bladder is empty, has the appearance of Lateral Ligaments.

It is attached, at the fore part of its Body, by Cellular Substance, somewhat condensed, to the Ossa Pubis, without the intervention of the Peritoneum; this becomes thicker and stronger towards the Neck of the

Bladder, and has sometimes of late been called *Fascia Vesicalis.*

It is also fixed to the Umbilicus by three Ligaments situated between the Peritoneum and Abdominal Muscles.—They are formed of the Urachus running upwards from the Fundus, and of the shrivelled Umbilical Arteries passing obliquely from the sides of the Bladder.

The Bladder, as well as the under end of the Rectum, is supported below by the Muscles, and by various Tendinous Fasciæ running between these.

The firmest connexion is by means of two Ligamentous Expansions, which run from each side of the Neck of the Bladder and Prostate Gland, to be fixed to the under and inner part of the Symphysis of the Ossa Pubis.—It is connected also at this place to the Penis, by the Urethra.

It is composed of different *Coats* joined together by loose Cellular Substance; the first of which is only a partial one continued from the Peritoneum.

The *Peritoneal* or *Common Coat*, recedes from the Abdominal Muscles at the top of the Pubes, and passes over the superior, and down upon the posterior and lateral parts of the Bladder to its under Extremity, or to near the termination of the Ureters, where it is about a finger's length from the Anus, and is here reflected upon the Rectum, and back and lateral part of the Pelvis, forming at this place a kind of *Cul de Sac.*

When the Bladder is much distended, it carries the Peritoneum with it, and leaves a space between that Membrane and the Pubes, of such length, that an Incision has frequently been made here, and large Calculi extracted from the Bladder, without penetrating into the Cavity of the Abdomen, or wounding the Peritoneum.

The *Second Coat* is termed *Muscular.*—It is composed of distinct Fleshy Fibres, though of a pale colour, interwoven with each other, and formed into Fasciculi.

The External Fibres run chiefly in a longitudinal direction, and are connected, at the under and fore part of the Bladder, with the Ossa Pubis.

The internal Fibres run in all directions, many of them appearing like flat Bands, which are intermixed with each other in the form of an irregular network.

The Muscular Fibres are contracted about the Neck of the Bladder, and form what has been termed *Sphincter Vesicæ*;—these, however, are merely the continuation of the other Fibres.

The Muscular Coat, by its contraction, occasions the complete evacuation of the Bladder.—The Fibres about the Neck of the Bladder, by acting separately from the rest of the Muscular Coat, prevent the involuntary discharge of the Urine.

The Cellular Substance under the Muscular Fibres is in considerable quantity, and is frequently termed *Nervous Coat.*

The *Inner Coat*, often called *Villous*, is smooth like the inside of the Peritoneum, but is a real Mucous Membrane. It is thin, yet so dense as to prevent the exudation of the Urine.

This Coat is rendered somewhat unequal by the projection of the Fasciculi of the Muscular Fibres; and when the Bladder is empty, it forms large Wrinkles or Rugæ.

The inside of the Bladder is very irritable, in consequence of which the desire to expel the Urine is excited. It is lined, however, by a Mucus discharged from its Arteries, which prevents it from being constantly irritated by that Fluid.

The under part of the Bladder is perforated by *three Openings*; of which one is placed anteriorly, and two posteriorly.

The anterior Opening is the beginning of the Passage called *Urethra*, and is surrounded by the Neck of the Bladder.

It comes off almost at a right Angle from the Bladder, about an inch or so above the undermost part, without any tapering of that Viscus.

The inner lining of the Urethra at the posterior part of the Neck of the Bladder is frequently formed, in old people, into longitudinal Folds. These, in the diseased state of the Prostate Gland, assist in the formation of the Lobes, which often project so much into the Cavity of the Bladder, as to have the effect of a Valve in closing up the Orifice of the Urethra.

The other two Openings of the Bladder are formed by the terminations of the Ureters, which run obliquely forwards and inwards, between the Muscular and Inner Coats of the Bladder.

They terminate in the Bladder at a little distance from each other, and at the same distance behind the beginning of the Urethra, each by a somewhat oval opening, which is more contracted than the Ureter is immediately above it.

Each of these openings is fixed by a Retinaculum formed by the inner Coat of the Bladder. This passes obliquely inwards and forwards, but is more distinctly seen when a Probe is introduced into the Orifice, and the part gently raised.

Between the terminations of the two Ureters, and extending from these to the beginning of the Urethra, is a space of a triangular form,—the *Trigone* of LIEUTAUD, which is sometimes distinguished by being of a whiter colour than the rest of the Bladder.

The *Arteries* of the Bladder come from various sources, but chiefly from the Umbilicalis and Pudenda Communis.

The *Veins* return to the Internal Iliacs :—They form a Plexus of considerable size upon each side of the Bladder, particularly about its Neck.

The *Lymphatics* accompany the principal Veins on the Bladder, and, at the under part and sides, pass into the Iliac Glands.

The *Nerves* are Branches of the Great Sympathetic and Sacral Nerves.

The Bladder receives the Urine from the Ureters by drops ; and sometimes by small Thread-like streams or squirts, till, by its accumulated quantity and acrimony, it forces the Organ to contract and expel it.

The Urine is expelled, partly by the contraction of the Bladder itself, and partly by the action of the Abdominal Muscles and Diaphragm pressing the Intestines against the Bladder, the Sphincter Vesicæ being at the same time relaxed.

The frequency of the evacuation depends upon the size and sensibility of the Bladder, upon the quantity of

Urine secreted, and the degree of acrimony it possesses. Certain states of the Mind, also, are apt to affect the Urinary Organs. Fear and anxiety sometimes produce sudden desire for evacuating the Bladder.

The Urine, when recently discharged from a healthy Person, is of a pale yellow colour, has a peculiar odour, and a bitterish taste, and is of an acid nature. After standing some time, it becomes alkaline, depositing an Acid, called *Lithic* or *Uric*.—But the state of this Fluid varies much according to the age and constitution of the Person, the nature of the Aliment taken into the Stomach, and the time the Urine has been retained in the Bladder.

According to the latest Authors, the following Substances are found in Urine, though variable in their proportions; viz. Water,—Muriates of Soda and Ammonia,—Phosphates of Soda, Ammonia, Lime, and Magnesia,—Carbonate of Lime,—Acetic, Carbonic, Uric, and Benzoic Acids,—Albumen,—Urea,—Resin,—and Sulphur.

Occasionally it contains other Substances, often Muriate of Potash, and sometimes Sulphate of Lime.

In Putrid Urine are chiefly found Ammonia,—Carbonate, Phosphate, Urate, Acetate, Benzoate, and Muriate of Ammonia,—Phosphates of Lime and Magnesia,—Muriate of Soda,—besides Precipitated Gelatin, and Phosphate of Lime.

TESTES.

The *Testes*, formerly termed *Didymi* or *Gemini*, are two Glandular Bodies situated in the Cavity of the

Scrotum, and are the most important part of Generation in a Male.

The *Scrotum*, which furnishes an External Covering to the Testes, is a continuation of the Common Integuments; has the same structure with the Skin in general; but is more plentifully supplied with Sebaceous Follicles; has no Fat in its Cellular Substance, and is occasionally relaxed and corrugated in a greater degree than the Skin in the outer parts of the Body, in consequence of its very intimate connexion with the Cremaster.

Upon the Surface of the Scrotum, there is a Superficial, longitudinal, projecting *Line*, which divides it into two equal parts, and has the name of *Raphè.*

The Inner Surface of the Scrotum is lined with Cellular Substance, which is firmer and more Vascular than in other places.

The Cellular Substance of the Scrotum, in consequence of its redness, Fibrous appearance, and supposed power of contraction, has, by many Anatomists, been considered as a Muscle, and called *Dartos.*—This opinion, however, has been for many years past, justly rejected.

The Cellular Substance of the Scrotum involves each Testicle singly, and forms a *Septum* between the two, which prevents Air or Water from passing readily from one side of the Scrotum to the other.

The *Vessels* and *Nerves* of the Scrotum are chiefly from those of the neighbouring parts.

The *Blood-vessels* are Branches of the Pudendal and Femoral.

The *Lymphatics* go mostly to the Inguinal,—but some of them accompany those of the Testes to the Lumbar Glands.

The Anterior part of the Scrotum derives its *Nerves* from the Lumbar, and the posterior from the Pudendal and Sciatic Nerves.

The Scrotum assists in supporting and protecting the Testes.

Under the Scrotum are two *Membranes* or *Coats*, proper to each of the Testes, the one termed *Vaginalis*, the other *Albuginea.*

The *Tunica Vaginalis*, named from its forming a Sheath, is of the same nature with the Peritoneum, being originally a Process of that Membrane, which, in a Fœtus, descends with the Testicle from the Abdomen.

It forms a shut Sac, which has no communication with any other part.

It incloses the Testicle as the Pericardium does the Heart, being only in contact with it, excepting behind, where it is *continuous* with the Albuginea.

It is considerably larger than the Testis which it incloses, reaches as high upon the Cord, and as much below the Testicle, as to allow the latter a certain degree of motion.

It is connected by its external Surface to the Cremaster, and partly by that Muscle to the inner Surface of the Scrotum.

It assists the Cremaster in supporting the Testis, and by being constantly moistened within by a fluid, exhaled from its Surface, and that of the Tunica Albuginea, it allows the Testicle to move easily.

The *Tunica Albuginea*, so called from its white colour, is, like the former Coat, originally a continuation of the Peritoneum, and invests the Body of the Testicle closely.

It is a thick, strong, dense, and inelastic Membrane, of a glistening appearance.

It is remarkably smooth on the outside, but internally it is rough and unequal, adhering every where firmly to the Body of the Testis.

It covers both the Testis and Substance called *Epididymis*, connects them to each other, gives strength to them, and conducts their Vessels in the same manner as the Mesentery does those of the Intestines.

The Body of the Testis is of a yellowish colour, and has a pulpy appearance,—is of an oval form, and a little flattened at its outer and inner sides. The Testes are larger after than before the age of Puberty. Frequently one Testicle, especially the right, is a little larger than the other.

The Testes are placed obliquely, with one end upwards and forwards, and the other end backwards and downwards.

The *Epididymis* is situated at the outer and back part of the Testis, and is inclosed in the same covering with it.

It begins at the upper part of the Testicle, immediately above the entry of the Blood-vessels; and this part of it being large and of a round form, is termed *Globus Major*, or *Head* of the Epididymis.

In its descent, it becomes somewhat smaller and flatter, and is attached behind to the Body of the Testicle, where the Blood-vessels enter; but it is loose at its fore part, the Tunica Albuginea dipping in this place, and forming a Cavity or Pouch between it and the Testicle.

The under part of it becomes more firmly attached to the Body of the Testicle, and forms the *Cauda*, or *Globus Minor*. It is then turned backwards upon itself, after which it sends out the Excretory Duct of the Testicle.

The Body of the Testis has numerous Arteries, Veins, Absorbents, and Nerves; but is principally composed of a collection of minute, tender, elastic Tubes, intricately convoluted, termed *Tubuli Seminiferi*, vel *Vasa Seminalia*.

The *Tubuli Seminiferi* are disposed in *Fasciculi* or Bundles, between *Septulæ* or *Partitions*, which are formed of Blood-vessels and Cellular Substance.

These Septulæ begin at the root or *Nucleus*, sometimes termed *Corpus Highmorianum*, situated at the back part of the Testicle, and extend in a radiated manner to the Tunica Albuginea.

The Testis is fixed behind by its Vessels, which are collected in a *Cord* termed *Spermatic*, but is loose and free before, to prevent it from being pinched.

The *Spermatic Cord*, strictly so called, extends obliquely from the Ring of the Obliquus Externus to the Body of the Testis, the obliquity being somewhat in proportion to the width of the Pelvis. It is composed of the Trunks of the different Vessels belonging to the Testicle, and of a quantity of Cellular Substance.

The Cord is covered by the Cremaster, and within it, by the same Process of the Peritoneum which forms the Tunica Vaginalis Testis, and which is here called the *Tunica Vaginalis* of the Spermatic Cord. In this part, however, the Process is so incorporated with the common Cellular Substance of the Cord, as to appear to form part of it. On the outside of the Cremaster, part of the Superficial Fascia, formerly described, is found, and which is sometimes termed CAMPER'S *Fascia.*

The under part of the Vagina of the Cord is separated by a Partition formed by the upper end of the Vaginal Coat of the Testicle, and by condensed Cellular Substance, so that no Liquor can easily pass from the Cord to the Testicle, or *vicè versa.*

The *Arteries* of the Testes termed *Arteriæ Spermaticæ* and *Arteriæ Preparantes,* arise, one on each side, from the fore part of the Aorta, a little below the Renal Arteries, opposite to, but at a little distance from, each other.

The *Spermatic Artery* crosses over the Psoas Muscles and Ureter, and descends near the Brim of the Pelvis, behind the Peritoneum, to the under part of the Abdomen.

At the lower part of the Abdomen, it gets into the Superior Abdominal Ring, under the edge of the Obliquus Internus and Transversalis, then perforates the Ring of the Obliquus Externus, and passes in the Spermatic Cord to the Testicle.

In its descent it gives Branches to the adjacent parts, and is so interlaced with the corresponding Veins, as to have been supposed by the Ancients to have large lateral communications with them.

After passing out of the Ring, it divides into Branches which go to the Testis at its posterior edge. They are partly dispersed upon the Epididymis, but the larger Branches run in a serpentine direction into the Substance of the Testicle, where they are minutely distributed upon the Surface of the Seminal Tubes.

Besides the Spermatic Artery, there is a smaller one from the Hypogastric, and frequently also a minute Branch from the Epigastric Artery, which accompany the Vas Deferens, and are dispersed along with the other Artery.

The *Veins* are much larger than the corresponding Arteries, and have several Valves in them, especially without the Abdomen, contrary to what belongs to the Veins of the other Viscera.

They form a *Plexus*, which accompanies the Artery on each side, and is sometimes called *Corpus Pampyniforme*, from a supposed resemblance to the Shoots of a Vine; or *Corpus Pyramidale*, from giving a Pyramidal form to the Cord.

The Plexus ascends in the Abdomen, upon the Surface of the Psoas; and about the part where it recedes from the Artery it forms a single Trunk, which, in the right side, terminates in the Vena Cava, nearly opposite to the origin of the Artery, and, in the left side, goes into the Renal Vein.

There is also a small inferior Spermatic Vein, which accompanies its Artery, and ends in the Hypogastric Vein.

The Nerves of the Testes are derived from the Renal, Aortic, and Lumbar Plexus, and, though very minute, they give the Testicle a more exquisite feeling than is bestowed on any other Secretory Organ.

The *Tubuli Seminiferi*, in the body of the Testicle, consist of numberless minute Ducts, which are of a Cylindrical form, have no division into Branches, and, when drawn out, are found to be several feet in length, and as small as so many fine Hairs.

They are first collected into Bundles between the Septulæ of the Testicle, and these again into others still smaller, each of the smaller being formed of a simple Tube, coiled up into a Conical form, with its Base forwards, and its Apex towards the posterior edge of the Testicle.

From the convoluted Seminal Tubes, an equal number of straight Vessels are sent out at the back part of the Testicle, under the name of *Vasa Recta.*

At the upper and back part of the Testicle, the Vasa Recta communicate, and form an irregular Plexus or Net-work, called *Rete Vasculosum Testis.*

The *Rete Testis* sends out from twelve to eighteen straight Tubes, termed *Vasa Efferentia,* which carry the Semen from the Testicle to the Epididymis.

Each *Vas Efferens* soon becomes convoluted, and forms a Conical Bundle with its Base towards the Epididymis, the whole getting the name of *Coni Vasculosi.*

The *Coni Vasculosi* are firmly connected by Cellular Substance, and are observed by DR MONRO, in his Treatise *De Testibus,* to compose somewhat more than a third part of the Epididymis.

The Vascular Cones gradually unite into a single Tube, which is many feet in length, and this, by its innumerable convolutions, constitutes the rest of the Epididymis, and though only about the size of a Hog's Bristle, transmits the whole of the Semen of that Testicle.

The single Tube becomes larger in its course and more convoluted, and at last, expanding its convolutions, it comes out greatly increased in size, and almost in a straight direction, under the name of *Vas Deferens.*

Besides the Ducts already described, a *Vas Aberrans* is sometimes observed, which is one of the Vascular Cones, wandering off, and terminating in the Epididymis lower than usual.

At other times, the same kind of Vessel passes a considerable way along the Spermatic Cord, and forms a *Processus Cæcus*, or Blind Duct, with a dilated Extremity, which does not communicate with any other part.

The Vas Deferens is about the size of a Surgeon's Probe, and is of a cylindrical form through the greater part of its length. It has no inflections in its course, but such as are necessary for its arrival at the place of its destination.

It ascends in the back part of the Spermatic Cord, having the Spermatic Blood-vessels on its fore part, but from which it is readily distinguished by its firmness.

At the under part of the Abdomen, it passes in through the Ring of the External Oblique Muscle, and at the Internal Abdominal Ring separates from the Blood-vessels, goes over the Psoas, and descends by the side of the Pelvis, covered by the Peritoneum.

In its descent in the Pelvis, it gets behind the Bladder, to which it closely adheres, follows the Curvature of that Viscus, gradually approaching its fellow till it arrives at the Vesicula Seminalis of the same side.

In this course it passes between the corresponding Umbilical Artery and Bladder, and also between the Bladder and Ureter, where it increases considerably in size, and becomes Cellular within. It continues under this enlarged appearance to near its termination, where it again contracts in its diameter, and becomes thinner and more tender in its substance.

The Vas Deferens is remarkable for the thickness and firmness of its Coats, and proportional smallness of its Cavity. Like most other Secretory Ducts, it is destitute of any visible Muscular Fibres, though it has been supposed by some Authors, that such a contractile power resides in the Seminal Ducts, as to assist the Vis a Tergo in propelling the Semen from the Testicle.

VESICULÆ SEMINALES AND PROSTATE GLAND.

The *Vesiculæ Seminales* are two small, white, Pyriform Receptacles, situated between the under and lateral parts of the Bladder and the Intestinum Rectum. —Each is about three inches in length, and nearly one in breadth, and a little flattened.

They are at a considerable distance from each other behind, but anteriorly they converge, and become contiguous to each other.

Each of them is shut at its posterior extremity, and is composed of a convoluted Tube, to the sides of which are attached a number of *Processes*, irregular in their form.

They are surrounded by a quantity of tough Cellular Substance, and by many Vessels and Nerves, but they have no Muscularity. Their Substance is somewhat similar to that of the Vasa Deferentia, but they are more tender.

Internally, they have a *Villous appearance*, and are formed of *Cells* which correspond with the irregularities on their external Surface, and communicate freely with each other.—Their shape, size, and general appearance, however, vary in different Subjects, and not unfrequently in the opposite sides of the same person.

Between the Vesiculæ Seminales, the ends of the Vasa Deferentia now become larger and Cellular, pass forwards till they arrive at the Prostate Gland, where each Vas Deferens again contracts, joins the Vesicula of that side at a very sharp Angle, but communicates so freely with it, that injected Fluids readily pass from the former to the latter.

From each Vesicula Seminalis and Vas Deferens of the same side, a *common Canal*, about a *finger's breadth* in length, passes out, which is firmly connected to its fellow, without communicating with it, and, becoming gradually smaller, pierces obliquely the Prostate Gland, and terminates in the under and back part of the Neck of the Bladder, a little before the beginning of the Urethra.

The *Orifices* of these Canals sometimes open in a Lacuna, which is covered behind by a Valve, that has its concave edge forwards; but more generally they are separated from each other by a *Caruncula*, or round projection of the Membrane of the Urethra, termed *Verumontanum*, from its supposed resemblance to a Javelin of the Ancients;—or *Caput Gallinaginis*, from its being broad behind, and rostriform before, and therefore compared to the Head and Beak of a *Woodcock*.

The Vesiculæ Seminales are commonly considered as

Reservoirs of the Semen, receiving it from the Vasa Deferentia, and afterwards, by a power inherent in themselves, assisted by the action of the neighbouring Muscles, particularly of the Levatores Ani,—propelling it into the Urethra.

The Semen is prevented from passing into the Bladder, the beginning of the Urethra being shut while that Fluid is expelled.

Notwithstanding the common received opinion regarding the use of the Vesiculæ Seminales, various experiments have been made on these Bodies by the late MR HUNTER, from which he was led to believe that they are not Reservoirs of Semen, but Glands secreting a particular Mucus;—that, with other parts, they are subservient to the purposes of Generation;—and that the Bulb of the Urethra is the Receptacle of the Semen, in which it is accumulated previous to its ejection.

The Semen, when recently ejected, is observed to be a whitish Viscid Fluid, of a peculiar odour, and to become more transparent and fluid by exposure to the Air. It is found to contain a great proportion of Water, some Mucilage, Phosphate of Lime, and Soda. LEEUENHOECK, by the aid of a Microscope, detected in it innumerable Animalcula, which he has particularly described in the Philosophical Transactions of last century.

The *Prostate Gland*, or Corpus Glandulosum, lies immediately behind the under end of the Symphysis Pubis, and rests upon the Intestinum Rectum, to both of which it is connected by Cellular Substance.

It is partly inclosed by the inferior Ligament of the Bladder, and by a Portion of the Levator Ani.

It surrounds and closely embraces the Neck of the Bladder, or beginning of the Urethra; but the greater part of it is placed posteriorly and laterally, having a Lobe projecting on each side. A very thin portion of it is found upon the upper or fore part of the Canal.

It is about the size of a Walnut, and of the figure of a Spanish Chesnut,—or it resembles a Heart as commonly painted on playing-cards, with the Base towards the Bladder, and the point towards the Penis.

The middle of the Base of the Prostate Gland, between the common Seminal Ducts and Bladder, is sometimes, especially in the diseased state, of a rounded form, and has been described by MR HOME, now SIR EVERARD HOME, in the Philosophical Transactions of 1806, as a *Third Lobe* of this Gland. This part of the Gland is also taken notice of in the works of MORGAGNI.

The Prostate has a red Fleshy appearance, and is of a Spongy Substance, but is one of the firmest Glands of the Body. It generally sends out *Ten* or *Twelve Ducts*, which open obliquely near the beginning of the Urethra, at the sides of the Caput Gallinaginis; the Orifices of these Ducts surrounding the terminations of the Seminal Canals.

From the Ducts of the Prostate Gland, a thin white Liquor is discharged, from the same causes, and at the same time with the Semen, into the Urethra, and is supposed to be useful in the Process of Generation;—or, according to some Authors, by its greater degree of Fluidity, it facilitates the passage of the more viscid Semen through the Urethra.

The Blood-vessels, Absorbents, and Nerves of the Vesiculæ Seminales and Prostate Gland, are in common with those of the parts which surround them.

PENIS.

The *Penis* consists of three Spongy Substances, two of which form the upper and lateral parts, or Body of the Penis, and are termed *Corpora Cavernosa Penis ;* the third surrounds the Urethra, and has the name of *Corpus Spongiosum Urethræ.*

The Penis is covered by a continuation of the Common Integuments, which are thinner here than elsewhere ; and, instead of Fat, there is, as in the Scrotum, a Reticular Substance only under the Skin.

At the anterior extremity of the Penis, the Integuments form a loose Fold, termed *Prepuce,* which covers the part called *Glans,* when the Penis is in a state of relaxation. The Prepuce is connected to the anterior and under part of the Glans, by a triangular Fold named *Frænum Preputii,* which serves as a Ligament.

The *Corpora Cavernosa Penis* resemble two equal but irregular Cylinders, or rather Portions of Cylinders, closely applied to the sides of each other, and each covered by a strong, elastic, Ligamentous Sheath, the Fibres of which run in a transverse, and partly in an oblique direction.

They arise by two blind conical extremities, called *Crura Penis,* from the inner part of the Crura of the

Ossa Ischia and Ossa Pubis, to both of which they are intimately connected by Ligamentous Substance, being in a manner confounded there with the Periosteum.

In their ascent along the Bones, they approach each other, like the strokes of the letter Y inverted, and at the under part of the Symphysis Pubis, unite, and continue united till they reach the Glans, where they terminate in a rounded extremity.

At the upper part of the root of the Penis, the Ligamentous Sheath of the Corpora Cavernosa sends up a Process of a triangular form, to be connected to the Symphysis Pubis, under the name of *Ligamentum Suspensorium*, by which the Body of the Penis is supported, and prevented from pressing too much upon the Scrotum.

By the union of the Corpora Cavernosa, a *Groove* is left above, for the principal Vein of the Penis, and a *Channel* below, for the Spongy Substance of the Urethra.

The internal Substance of the Corpora Cavernosa consists of *loose Reticular Plates*, somewhat similar to the Cancelli in the ends of long Bones, and, like them, readily communicating with each other.

Upon the Cells of the Corpora Cavernosa the Arteries are plentifully dispersed, and open freely into them; the Blood of the Arteries tinging the Cells in the relaxed state of the Penis, and filling them completely when it is distended.

CUVIER considers the Corpora Cavernosa as being formed of an extremely complicated texture, of ramifications of Blood-vessels, particularly of Veins.

The Corpora Cavernosa are united to each other by a *Septum*, formed by a continuation of the Elastic Ligaments which cover these Bodies.

The *Septum Penis* is composed of thin Tendinous-like Cords, extending across, nearly in a parallel direction, from the Dorsum Penis to the Corpus Spongiosum Urethræ, and thus guarding against an over-distension.

Between the different Cords, *Fissures* are left, through which the Blood, or an injected Fluid, passes without obstruction from one of the Corpora Cavernosa to the other; rendering the Penis in this manner one general Cavity, separated by the Septum into two apartments.

The *Corpus Spongiosum Urethræ* is situated under and between the Corpora Cavernosa Penis, but projects considerably beyond them.

It begins a little behind the part where the Corpora Cavernosa are united, adheres to them by condensed Cellular Substance, and terminates at the anterior extremity of the Penis.

It has an external covering similar to that of the Corpora Cavernosa Penis, but more delicate, and has more of a Membranous appearance.

The Posterior part of the Corpus Spongiosum is dilated into a large *Pendulous Process*, of a *Conical* form, situated within the Skin of the Peritoneum, and termed *Bulb* of the Urethra.

The Bulb extends from the root of the Penis to near the Anus. It projects most towards the under and back part, is divided anteriorly by a Septum, and is covered at its under and lateral parts by the Acceleratores Urinæ, and by a thin Layer of Tendinous Fibres, which assist in bracing this part of the Penis.

From the Bulb, the Corpus Spongiosum is continued along the under part of the Corpora Cavernosa, of a Cylindrical figure, and at the end of these expands into the *Glans Penis*, which is of an oval form, and placed obliquely. The Glans covers and incloses the ends of the Corpora Cavernosa.

The *Glans* is separated from the Corpora Cavernosa by a continuation of the Ligamentous Sheath which covers them, and is encircled at its posterior part by a prominent Margin, called *Corona Glandis;* behind which is a Cervix.

The Surface of the Glands is covered by a *Plexus* chiefly of Venous Vessels, and with *Nervous Papillæ;* and these are inclosed in the Skin continued from the inside of the Prepuce, but now become so delicate, that the colour of the Corpus Spongiosum of the Gland appears through it.

The Nervous Papillæ render the Glans the principal seat of the sensibility of which the Penis is susceptible.

About the Cervix and Corona of the Glans are many *Follicles*, termed *Glandulæ Odoriferæ*, which discharge a Sebaceous Matter, to preserve the sensibility of the Glans, and allow the Prepuce to move backwards and forwards upon it with facility.

The Internal Structure of the Bulb of the Urethra and Glans Penis, is of the same nature with that of the Corpora Cavernosa; and the Internal Structure of the rest of the Corpus Spongiosum differs from that of the Corpora Cavernosa only in this, that the Cells are smaller, and of a more delicate Texture. Some Anatomists consider the greater part of the Corpus Spongiosum as merely a Plexus of convoluted Blood-vessels, particularly of Veins.

The *Urethra* is a long and very elastic Canal, the common diameter of which is nearly equal to that of a writing-pen, though it is capable of receiving bodies of a greater size. It begins at the under and fore part of the Bladder, and here the Apex of the *Trigone* of LIEUTAUD frequently projects, and is sometimes called *La-Luette*, or *Uvula Vesicæ.*

The Urethra, at its beginning, is inclosed by the Prostate Gland; it runs next through the Corpus Spongiosum, and terminates in the point of the Penis by a longitudinal Orifice, the whole length commonly including a space of eight or nine inches.

At its Origin it descends a little, and then passes forwards under the Symphysis of the Ossa Pubis; to which it is closely connected by Cellular Substance. It then ascends, in a curved direction, at the outer and fore part of the Ossa Pubis; varying in the remainder of its course, according to the different degrees of relaxation or distension of the Penis.

There are commonly *three Dilatations* in the Urethra; one of which is in the Prostate Gland, the second in the Bulb of the Urethra, and the third, which is sometimes called *Fossicula* Navicularis, about the beginning or back part of the Glans.

In general, it has also the same number of *slight Contractions*; the first at its origin from the Bladder, the second between the point of the Prostate Gland and Bulb of the Urethra, and the third at the point of the Glans.

Between the point of the Prostate Gland and part where the Urethra penetrates the Corpus Spongiosum,

—including nearly the space of an inch,—the Urinary Passage is entirely *Membranous*, and destitute of Spongy Substance, but it is surrounded by a strong Ligamentous Membrane, which is stretched between the Crura of the Ossa Pubis, and forms the Interosseous Ligament, or the Triangular Ligament of former Authors.

Where the Urethra perforates this Ligament, it is more contracted than it is farther forwards, when it enters the Bulb, and this is the part where the principal resistance is found in the introduction of a Sound or a Catheter.

At the upper side of the Bulb, the Urethra enters the Corpus Spongiosum, in which it is inclosed to its termination in the point of the Penis.

The inside of the Urethra is lined by a very *Vascular* and *sensible Membrane*, continued from the inner Coat of the Bladder, but which is observed to possess a certain degree of contractility, and is therefore presumed by several Anatomists to be endowed with Muscular Fibres.

Between the Corpus Spongiosum and Membrane which lines the Urethra, especially towards the Septum Penis, numerous *Lacunæ* of different sizes are situated, one or two of which in particular, next the Glans, are often considerably larger than the rest.

They run in a longitudinal direction from behind forwards, and, perforating the Urethra by Orifices large enough to admit a Bristle, they discharge a bland Mucus for the defence of the Urethra.

Besides the Lacunæ, two small Bodies of a yellowish colour, each about the size of a Garden-pea, are frequently met with, and are termed, from their Discoverer, Cowper's *Glands*. They have likewise the name of *Anti-prostatæ* and *Prostatæ Inferiores*.

They are situated at the sides of the Membranous part of the Urethra,—between its Bulb and the point of the Prostate Gland, but nearer the former,—and covered by the Acceleratores Urinæ.

Each sends out a small Duct, which terminates obliquely in the Urethra, at the bulbous part.

They are observed to discharge a Fluid, which is supposed to serve the same purpose with that of the Lacunæ.

The *Arteries* of the Penis are chiefly from the Pudicæ Communes, which are Branches of the Internal Iliacs, and partly from the Femoral Arteries.

Each of the Pudic Arteries having passed out of the Pelvis through the great Notch of the Os Ilium, runs between the Sacro-sciatic Ligaments to the inner side of the Tuber Ischii, from which it passes along the Crus of that Bone and of the Os Pubis, to the root of the Penis.

In its course, it furnishes Branches to the adjacent parts, and afterwards gives off three principal Branches, which belong to the Penis:—One of these goes to the Bulb of the Urethra, to be dispersed in the Corpus Spongiosum;—the other two, which are longer than the former, go to the Body of the Penis; one of them penetrating its Crus, and running in the axis of the Corpus Cavernosum, as may be readily seen by a longitudinal section of this part; the other passing between the Symphysis Pubis and joining of the Crura Penis, and extending along the Dorsum as far as the Corona Glandis.

The Branches which the Penis receives from the Femoral Artery communicate with those of the Pudics, and are chiefly dispersed upon the Integuments.

The Arteries of the Penis are divided into minute Ramifications, which communicate with each other, and with their fellows on the opposite side, and terminate partly in the corresponding Veins, and partly in the Cells of the Penis.

The *Veins* arise, some from the extremities of the Arteries, and others by large open Mouths from the Cells of the Penis.

The greater number of the Veins unite into a Trunk, called *Vena Magna Penis*, which runs in the superior Groove formed by the union of the Corpora Cavernosa, and is furnished with Valves, and with thick strong Coats.

The Vena Magna, at the under end of the Symphysis Pubis, separates into Right and Left Plexus, which pass to the corresponding Iliac Veins.

To an obstruction of the course of the Blood through the Veins, by a spasmodic contraction of the Veins themselves, and by the pressure of the Muscles at the root of the Penis, together with an increased influx through the Arteries, is owing that accumulation of Blood in the Corpora Cavernosa and Corpus Spongiosum, which occasions a distension of the Penis.

The relaxation of the Penis happens from the causes which produced the distension being removed; the elastic Ligamentous Membrane which covers the Penis again forcing the Blood from the Cells into the Veins.

Upon the Surface of the Penis, there are small superficial Veins, which communicate with those deeper seated, and commonly terminate by one or more Branches in the Veins at the top of the Thighs.

These Branches assist in carrying on the circulation, and return part of the Blood during the distension of the Penis.

Of the *Lymphatics* of the Penis, those from the Prepuce and Skin, in general, go to the right and left Inguinal Glands, while the Lymphatics from the Glans and Body of the Penis accompany the Arteries into the under part of the Pelvis.

The *Nerves* of the Penis are large compared to its size, but are quite in proportion to the great sensibility of that Organ. They come from that part of the Spinal Nerves which gives origin to those termed *Sciatic*, and are distributed chiefly upon the Ligamentous Sheath which incloses the Corpora Cavernósa.

The most considerable of them are two large Cords, situated upon the Dorsum Penis, more laterally than the Arteries which lie between them and the principal Vein.

For the MUSCLES *of the Penis,* see Vol. I. Part II.

The Penis serves to convey the Urine from the Bladder, and to eject the Semen into the Vagina. The Cavernous Structure allows the Penis to be distended or relaxed as occasion may require. The distension of the Penis serves to give the proper degree of consistence for its introduction into the Vagina; the Glans, by Friction, exciting the Feelings requisite for the expulsion of the Semen in a Male, and for conception in a Female.

OF THE
ORGANS OF URINE, AND UNIMPREGNATED PARTS OF GENERATION, IN THE FEMALE.

Organs of Urine.

The *Kidneys, Renal Glands,* and *Ureters,* have the same situation and structure as in the Male.

The *Bladder* also holds the same place behind the Ossa Pubis, but rises higher when it is in the distended state.

It is proportionally larger than the Bladder of the Male, and is broader from one side to the other, corresponding to the Cavity of the Pelvis to which it belongs, and to the quantity of Urine Females are sometimes under the necessity of retaining in it.

The *Urethra* is much shorter,—being only about an inch and a half, or from that to two inches in length,—and straighter than in the Male, having only a slight curve downwards between its extremities.

It is produced from the most depending part or Neck of the Bladder, and is directed almost horizontally under the Symphysis of the Ossa Pubis. It has no Prostate Gland, but is partly covered by the Corpus Spongiosum Vaginæ, and is furnished, as in the Male, with *Lacunæ*, which open into it, and discharge a Mucus to defend it from the Urine.

The Parts of Generation are divided into *Internal* and *External*. The former consist of the Uterus and its Appendages.

INTERNAL PARTS OF GENERATION.

The *Uterus*, *Matrix*, or *Womb*, is a hollow Viscus situated in the Pelvis, between the Bladder and Rectum, with which it is connected. It is naturally placed in an oblique situation, with its under end directed a little forward; but the obliquity must vary according to the state of the Bowels, with which it is in contact.

It is of a *triangular Figure*, and a little flattened before and behind, but more so anteriorly; is large above, small below, and has two angles at its upper and lateral parts, called *Corners* of the *Uterus*.

It is distinguished into *Fundus*, or upper part, which includes the space above the insertion of the Tubes called FALLOPIAN, the *Body* or middle, and *Cervix* or under part; the two last being nearly of equal length.

The extent and figure of the Uterus varies considerably in different Subjects.—In Women who have never been pregnant, it is commonly about two inches and a half in length, about one inch and a half to two inches in breadth at the Fundus, and about half as broad at the Cervix.—It is near an inch in thickness, and is larger in Women who have born Children than in Virgins; yet in the former, when in advanced life, it shrinks by degrees to nearly the size it had in the Virgin state.

The Cavity, like the external part of the Uterus, is of a *triangular form*, but is small in proportion to the size of the Organ,—being scarcely capable of containing the Kernel of an Almond, and has its anterior and posterior Surfaces closely applied to each other.

It is covered externally through its whole length with a smooth polished Coat, continued from the Peritoneum, which also covers the posterior half of the under part of the Vagina, is reflected forwards upon the Bladder, backwards over the Rectum, and laterally towards the sides of the Pelvis.

In Substance it is of a compact, Cellular, and Fleshy nature, and plentifully supplied with Blood-vessels: The Fleshy Fibres, however, are only seen distinctly in the Gravid Uterus.

It is remarkably Vascular in its Body, less so in its Cervix, and is nearly of the same thickness throughout, excepting at its corners, where the Uterine or FALLOPIAN Tubes terminate.

It is lined with a fine and very Vascular Membrane, of a somewhat Porous and Villous appearance, in which the Arteries terminate which discharge the Menstrual Fluid.

The Cavity of the Cervix has *two small Longitudinal Lines* projecting in it, one in the anterior, the other in the posterior part, on each side of which are numerous *Rugæ*.

The *Rugæ* run in an oblique transverse direction, and are formed, not only by the Inner Membrane, but also by the Fibres which compose the Body of the Uterus.

Between the Rugæ are many small *Follicles*, which discharge a Mucus for lubricating the parts near which they are placed:—Some of them, being of a roundish form, were mistaken by NABOTH for Female Ovula.

The under part of the Cervix projects into the Vagina, somewhat in form of the Glans Penis, and is perforated by a transverse Slit, termed *Os Internum Uteri;* or, from the resemblance of this part to the Mouth of the Tench, *Os Tincæ*.

The *Os Tincæ*, in a Virgin Uterus, is about the size of the Orifice of the Urethra in a Male, but nearly twice as large in the Uterus of a Woman who has born Children.

It is smooth on its external Surface, is placed obliquely, in a direction towards the back part of the Vagina, and is surrounded with several Mucous Follicles.

The *Appendages* of the Uterus are, the *Ligamenta Lata*, *Ligamenta Rotunda*, the *Ovaria*, the FALLOPIAN *Tubes*, and the *Vagina*.

The *Ligamenta Lata*, termed sometimes *Alæ Vespertilionis*, are two Membranous Productions or Doublings of the Peritoneum, sent from the edges of the Uterus and posterior extremity of the Vagina, in a transverse direction, to be fixed to, and to line the sides of the Pelvis.

The Anterior Layer of these Ligaments is continued to the sides of the Bladder, and the posterior is continued in a similar manner to the Rectum, these two productions of the Peritoneum terminating below in two

Cul de Sacs; one between the Bladder and Uterus, the other between the Uterus and Rectum.

The Uterus and Ligamenta Lata separate the Pelvis into anterior and posterior Cavities or Chambers, and the Ligamenta Lata are subdivided into large and small, or anterior and posterior Alæ or Pinions.

The Ligamenta Lata contain and support the Ovaria and Uterine Tubes, with part of the Ligamenta Rotunda, Spermatic, and Uterine Vessels and Nerves, &c.; connect the Uterus to the sides of the Pelvis, and assist in retaining it in its place. In the time of Gestation, they become effaced by furnishing the distended Uterus with part of its external covering.

The *Ligamenta Rotunda* are two long and slender Cords, composed chiefly of Blood-vessels and Ligamentous Fibres. They arise immediately before and below the Fallopian Tubes, from the corners of the Uterus, from which they descend obliquely in the Ligamenta Lata, diminishing a little in their course towards the Groins.

They pass through the Rings of the Abdominal Muscles, in the same manner as the Spermatic Cords do in the Male, and are afterwards inserted by separate Branches into the upper and lateral parts of the Pudendum, where they are insensibly lost.

They assist the Ligamenta Lata in preserving the equilibrium of the Uterus.

The *Ovaria*, anciently called *Testes Muliebres*, are situated at the sides of the Fundus Uteri, about an inch distant from it, and are contained in the posterior Pinions of the Ligamenta Lata, which form a Coat to them, similar to the Tunica Albuginea Testis.

The Ovaria are plain above, and prominent and semi-oval below, flattened at their anterior and posterior Surface; and the size of each, when in a state of the greatest maturity, is nearly equal to that of half of the Male Testicle.

In the vigour of life they are large, uniform, and smooth, but become small, unequal, and shrivelled, in old Women, and in those who have born many Children. This unequal appearance, however, is greatly owing to the habit of Body, as it frequently occurs in a young Adult Virgin.

They are attached to the Uterus by the Ligamenta Lata, and by two small Cords termed *Ligamenta Rotunda Ovarii*, which were mistaken by the Ancients for Vasa Deferentia, carrying a secreted Liquor to the Uterus.

They are composed internally of a loose whitish Cellular and Spongy Substance, intermixed with Vessels and Nerves, and contain a number of small Vesicles called *Ova*, filled with a limpid Fluid, which partakes of the qualities of the white of an Egg.

These Vesicles differ in the same Ovarium, from the size of a Mustard-seed to that of a small Garden-Pea, and the largest are commonly placed nearest the Surface.

The number of Ova is differently estimated by different Anatomists: from ten to about twenty having been found in one Ovarium.

According to experiments made by MR JOHN HUNTER, it is ascertained, that the number of Ova existing originally in each Ovarium, whether that number be great or small, may be diminished, but cannot be increased.

The Ovaria serve for the nourishment of the Ova, which contain the Rudiments of the Fœtus, and may be said to be of the same importance in the Process of Generation that the Testes are in a Male.

The *Uterine*, or FALLOPIAN *Tubes*, compared in shape, by FALLOPIUS, to that of a trumpet, are two Conical and Vermiform Canals, attached to the Corners of the Uterus, and terminating in it, each by a *small Opening* which scarcely admits the entrance of a Bristle.

They become gradually larger in their passage towards the sides of the Pelvis; near their outer extremities, they are convoluted and considerably dilated, but are afterwards suddenly contracted, and terminate by *open Mouths*, each sufficiently large to admit the point of a Goose-quill.

Their outer ends are free and fluctuating in the Pelvis, and expand into many irregular jagged or pointed Processes, called *Fimbriæ*, which are considerably longer at one side of the Tube than the other.

The Tubes are commonly about four or five inches in length, and are contained in a Doubling of the Ligamenta Lata.—In their natural situation, they lie near the Ovaria; but when drawn out and extended, are a finger's-breadth distant from them.

The Structure of the Tubes somewhat resembles that of the Uterus, and, like it, they are capable of dilatation and contraction: Their inner side, however, is of a different nature, being furnished with many small longitudinal Plicæ, which have a Muscular appearance, and which are most conspicuous towards the outer extremities. They have a very large proportion of Blood-vessels which run between their outer and inner Membranes.

The Tubes are supposed to convey the prolific part of the Male Semen from the Uterus to the Ovaria, in order to fecundate the Ova; and by grasping that part of the Ovarium where the ripest Ovum is situated, to carry the Ovum according to some authors, or its contents only according to the opinion of others, to be mixed with the Male Semen, and to be lodged in the Cavity of the Uterus.

One of the Tubes has been observed, in a few instances, in Females who have been killed soon after Coition, embracing the Ovarium by means of its Fimbriæ.

The *Vagina* is a Membranous Canal, which extends from the neck of the Uterus to the Opening of the Pudendum.

It is situated below the Urethra, and at the under and back part of the Bladder, and over the under part of the Intestinum Rectum; to each of which it is very closely connected by Cellular Substance.

It begins a little above the internal Orifice of the Uterus, which it embraces, but reaches higher at the posterior than anterior part of that Opening; from which circumstance, together with a slight Curvature it has backwards, the Canal is found to be longer in its posterior than anterior Surface.

From the Os Tincæ it passes downwards and forwards, and terminates between the Labia Pudendi; the Axis of the Vagina forming a considerable Angle with that of the Uterus.

The dimensions of the Vagina correspond with the size of the Penis in the Male, but vary according to the temperament of the Body, and become larger in Women who have born Children.

The Body of the Vagina is composed of thick, strong, Membranous parts, which are very dilatable, and plentifully supplied with Blood-vessels. It is furnished internally with numerous irregular *Rugæ* or Wrinkles, and Nervous *Papillæ;* the former of which considerably diminish the Capacity of the Canal, and the latter add to its sensibility.

The *Rugæ* run in a transverse direction, and are so disposed as to divide the Vagina into anterior and posterior *Columns*, which join together laterally, and produce a *Raphè* at the right and left sides.

They are deepest, largest, and most crowded, upon the anterior and towards the outer part of the Vagina; are most conspicuous in Virgins, less so in married Women, and become more and more effaced in those who have born Children.—The Rugæ augment the Friction during Coition, and facilitate the distension of the Vagina during Child-birth.

The whole extent of the Vagina, particularly towards its outer extremity, is furnished with small *Follicles*, the Orifices of which can frequently be seen.

They supply a Mucus, with which the Canal is always lubricated, and which is discharged, in the time of Coition, in such abundance, as to have been formerly considered as an emission of Female Semen.

The outer end of the Vagina is covered, on each side, by a Substance composed of Blood-vessels and Cells similar to those of the Penis, and described by Dr

GRAAF under the name of *Plexus Reteformis*, and by later Anatomists, under that of *Corpus Cavernosum Vaginæ.*

The *Corpora Cavernosa* are covered by the Sphincter Vaginæ, the action of which, joined to the dilatation of these Bodies, serves to contract the entry of the Vagina in the time of Coition.

The Vagina receives the Penis and Semen, and conveys from the Uterus the Menstrual Flux, the Fœtus, Secundines, and the Lochia.

The Uterus, with its Ligaments, Ovaria, and Uterine Tubes, are supplied with Blood from the Spermatic and Uterine Arteries.

The *Spermatic Arteries* arise from the Aorta, as in a Male, and descend for some way through the Abdomen. They run next in the Ligamenta Lata, to be dispersed upon the Ovaria and Uterine Tubes, and afterwards upon the Fundus of the Uterus. In the progress of their course, they have a serpentine appearance.

The *Uterine Arteries* are derived from the internal Iliacs, and are much larger than the Spermatics. They direct their course, first to the under part of the Uterus, after which each splits into the proper Uterine and the Vaginal Branches. The Uterine Arteries ascend along the edges of the Uterus, and near its upper part join the Spermatics. The Vaginal Arteries run along the lateral parts of the Inner Portion of the Vagina.

Chiefly from the Uterine, and partly from the Spermatic Arteries, many small Branches are furnished, which run in a Serpentine manner, and communicate with their fellows in the opposite sides of the Uterus, so as to supply the whole Substance of that Viscus.

The Vagina is supplied on each side by the *Vaginal Arteries* from the Uterine, and by small Branches from the Umbilical, middle Hæmorrhoidal, and Pudic Arteries.

The *Spermatic Veins*, in passing from the Ovaria and Uterus, form a complicated Plexus. They have the same termination as in the Male, but are considerably larger.—The Uterine and the Vaginal Veins run into the Internal Iliacs.

The Lymphatics of the Uterus and its Appendages, like the Blood-vessels, run also in two Sets. Those of the one Set accompany the Spermatic Blood-vessels, and, in a similar manner to the Absorbents of the Testes in a Male, go to the Lumbar Glands. Those of the other correspond with the Hypogastric Blood-vessels, and terminate in the Glands at the lateral parts of the Pelvis.

The *Nerves* are from the Lumbar, Sacral, and Great Sympathetics.

The Uterus, by means of the Fallopian Tubes, receives from the Ovaria the Rudiments of the Fœtus,—nourishes it, and, after bringing it to maturity, expels it through the Os Internum Uteri and Vagina.

From the Arteries of the inner Surface of the Uterus, the Menstrual Evacuation is also discharged.

The *Menses* or Courses commonly make their appearance, in the Females of this Country, about the fourteenth year, but two or three years sooner in hot Climates, and often as much later in colder Regions. The commencement is affected also by the nature of the Constitution, and the manner of living.

After the periodical Evacuations have begun, they recur generally every fourth Week while the Person is in perfect health, though the period varies a little in different Women. They cease during Pregnancy and Suckling, but there are now and then instances to the contrary.

The duration of each Menstruation is also various; in general they continue to flow for three or four days, in which time five or six ounces are commonly discharged. But the duration and quantity are for ordinary less in the robust, and in cold Climates, and more in those of relaxed habits, or living in hot Countries.

From the Surface of the Vagina, part of the Menstrual Flux has by many been also supposed to be derived; but those who have seen the discharge from the Uterus, in cases of a Prolapsus of that Organ, do not take notice of having observed any evacuation directly from this passage.

The Menses for ordinary begin to be interrupted about the fortieth year, and commonly disappear about the forty-fifth, but soonest in Women where they have begun most early. After this period, Impregnation generally does not take place.

According to Experiments made by MR BRANDE, upon the Menstrual Discharge, collected from a Woman with a Prolapsus of the Uterus, it had the properties of a very concentrated solution of the Colouring Matter of the Blood in a diluted Serum, though he could detect no traces of Iron by the usual modes of Analysis. DR F. LAVAGNA concludes, from some experiments on the Menstrual Blood, that it differs from pure Blood only in the want of Fibrin.

EXTERNAL PARTS OF GENERATION.

The *External Parts* are those which may be seen without dissection. They consist of the Pudendum, and what it incloses. The *Pudendum*, or *Vulva*, is formed of two prominent sides, termed *Labia Pudendi*, *Labia Externa*, vel *Alæ Majores*. These are contiguous when the Limbs are not much separated, thereby preventing the access of Air to the Internal Parts, which they at the same time protect and conceal.

The upper part of the Pudendum, named *Pubes*, or *Mons Veneris*, is situated on the fore side of the Ossa Pubis, and is covered with Hair similar to that in a Male, to prevent the Skin from being injured by venereal intercourse. In both Sexes, the Hairs begin to grow about the same period of life.

The Pubes is composed of the common Integuments, under which a considerable quantity of Fat is situated, rendering it thick, soft, and prominent.

The *Labia Pudendi* extend from the Pubes to within an inch of the Anus, the space between the Pudendum and Anus obtaining the name of *Perineum*, from a Moisture supposed to flow about this part of the Skin.—It is sometimes also called *Anterior Perineum*, to distinguish it from that part which extends from the Anus to the Coccyx, termed by some Anatomists, *Posterior Perineum*.

The Opening between the two Labia has the name of *Fossa Magna*.—It increases a little in size and depth as it descends, and forms a small Boat-like Cavity at its under extremity, termed *Fossa Navicularis*.

The Labia are thickest above, becoming thinner below, and terminate in a transverse Fold of the Skin, called *Frænum*, *Furcula*, or *Fourchette*, which is frequently lacerated in the first Delivery.

The Labia are composed of the Skin elevated by a large quantity of Cellular Substance and some Fat, and lined by a very Vascular Membrane, which is thin, tender, and red, like the inside of the lips. They are also furnished with numberless Sebaceous Follicles, secreting a Liquor by which the parts are preserved smooth and moist.

Between the upper ends of the Labia, is the Substance termed *Clitoris*, and by some *Mentula Muliebris*, —not exceeding an inch in length, and little more than the third part of that in thickness. It is tied down to the fore part of the Symphysis Pubis, and in its ordinary state, is in a manner buried under the Skin.

It is extremely Vascular and Nervous, and is composed, like the Penis in a Male, of two *Crura* and *Corpora Cavernosa*, which are occasionally distended with Blood. They are contained in a Ligamentous Sheath, and have a Septum between them.

The *Crura* are upwards of twice the length of the *Body* of the Clitoris, and, together with Muscles belonging to them, arise, as the Crura of the Penis do in a Male, from the Crura of the Ossa Ischia and Ossa Pubis.

The Clitoris is also provided with a *Ligamentum Suspensorium*, by which it is connected to the Ossa Pubis, and with a *Glans*, which, like that of the Penis, is extremely sensible, but has no perforation in it for the passage of Urine.

It is covered by a continuation of the Skin of the Labia, which, at its inferior extremity, forms a Semilunar Fold, termed *Preputium Clitoridis*.

The Prepuce is furnished with *Glandulæ Odoriferæ* upon its inner Surface, and with a small Frænum below, which fixes it to the Glans.

The Clitoris possesses great sensibility. In the time of Coition, the Glans Clitoridis is supposed to produce nearly the same sensation in a Female, as the Glans Penis does in a Male.

At the under and outer part of the Clitoris are two Bodies, called *Nymphæ*, which arise narrow from the Prepuce and Glans, and run obliquely downwards and outwards along the inside of the Labia, increasing in breadth, but suddenly contracting again in size at their lower extremity.

They are chiefly formed by a production of the inside of the Labia, have the same florid colour with them, and in their natural state are contiguous, and cover the Orifice of the Urethra.

They are sometimes of unequal size, and not unfrequently, particularly in warm Climates, project beyond the edges of the Labia. In Hottentot Women, they are said to hang pendulous between the Thighs.

Their internal Structure consists of Cellular Substance, with a large proportion of Blood-vessels: They have also many Nervous Papillæ, which render them very sensible; and Sebaceous Follicles, the contents of which, of a Fetid nature, prevent them from being injured by the Urine.

The Nymphæ assist in directing the course of the Urine from the Urethra, and in preventing the Air from entering the Vagina.—They also tend to enlarge the passage for the Child in the time of Parturition.

Between the Perineum and Nymphæ, there is a *Vestibulum*, or smooth *Cavity*, which is most complete in Virgins, and leads to two Passages,—to the Urethra above, and to the Vagina below.

The *Orifice of the Urethra* is placed a little below the Glans of the Clitoris, and between the two Nymphæ, and is surrounded by a Vascular Spongy Eminence, which projects at its under part,—called by some Authors *Corpus Glandulosum*, vel *Glandulæ Prostatæ Mulierum.*

The Corpus Glandulosum is perforated by *Lacunæ;* some of which are of considerable depth, and discharge a Viscid Matter round the Orifice of the Urethra.

The Corpus Glandulosum directs the point of the Finger to the Orifice of the Urethra, without the assistance of the Eye, in discharging the Urine by a Catheter.

The *Orifice of the Vagina*, termed likewise *Os Externum Uteri*, is placed immediately under that of the Urethra, and is naturally straiter than the rest of the Canal; but in the Virgin state, is still more contracted by the Substance called *Hymen*, or *Circulus Membranosus*, which forms an incomplete Septum between the Vagina and External Parts.

The *Hymen* is formed of a double Membrane, and is red and sensible like the Vagina itself, the inner part being derived from that Canal, the outer from the Labia Pudendi. It approaches to a circular figure, but the Circle is frequently incomplete next the Orifice of the Urethra, or the Membrane is of a Semilunar form, the broad part being turned towards the Perineum.

When the Hymen is ruptured, which is commonly in the first Sexual intercourse, it degenerates into small Conical Papillæ, termed *Carunculæ Myrtiformes*, from their supposed resemblance to Myrtle-berries.

The Hymen has been considered as a test of Virginity;—but neither the presence nor the absence of this Membrane can be depended on as a certain criterion.

Sometimes the Hymen is impervious, in which case the Menstrual Fluid is retained in the Vagina, till an incision is made to allow it to be discharged.

About the Orifice of the Vagina are several Mucous Follicles, similar to those round the Opening of the Urethra.

The *Blood-vessels* and *Nerves* of the External Parts are from the Pudic Branches, and are dispersed in numerous Ramifications upon the end of the Vagina, Labia Externa, and Clitoris.

The *Absorbents* pass partly to the Inguinal Glands, and partly to those placed at the sides of the Pelvis, or upon the Lumbar Vertebræ.

OF THE GRAVID UTERUS.

WHEN the Rudiments of the Fœtus have been conveyed from one of the Ovaria into the Cavity of the Uterus, through the medium of the corresponding Uterine Tube, whether in the state of a Fluid only, or of a complete Ovum, *Impregnation* is said to have taken place.

The Rudiments of the Fœtus have been supposed to come from the Father, or from the Mother, or from both; at any rate, it is ascertained, that something absolutely necessary for Conception is derived from one of the Ovaria, and that, in consequence of a Stimulus given by the Male Semen, the Rudiments of the Child proceed from this Ovarium through the Tube of the same side into the Uterus.

In the case of a single Child, the Rudiments come from one of the Ovaria, and go through the corresponding Tube. When there are Twins, one Fœtus sometimes comes from each Ovarium; at other times, the two come from one Ovarium only.

Some days after Impregnation, an *Ovum*, consisting of a Vesicle filled with a limpid Fluid, is found in the Cavity of the Uterus.

The Ovum, when first visible, is observed to have a smooth Surface, but in a short time thereafter it sends off flocculent Branches, the greater part of which are by degrees converted into a *Placenta* at that part of the Uterus where the Ovum happens to be first attached; the Branches covering the rest of the Ovum becoming matted together, form what is termed *Spongy Chorion.*

The Rudiments of the Fœtus, however, are not always conveyed to the Uterus after Impregnation, for sometimes a Fœtus is found in the Ovarium, at other times in one of the Uterine Tubes; and some rare instances have occurred, where the Embryo has dropped from one of the Ovaria or Tubes into the Cavity of the Abdomen, and where a Placenta has been formed, by which it has been nourished. In these cases, which are called *Extra-uterine Conceptions*, the Uterus is also found to be somewhat enlarged during the time of Pregnancy.

The Ovum, at the early period of Gestation, consists of a thin *Membranous Capsule*, which incloses the Embryo or Germ with the Umbilical Cord and Waters; and the Capsule, again, consists of an Internal Membrane called *Amnios*, on the outside of which is another, termed *True Chorion*, which is thicker and stronger than the former, and thicker in the early than in the late periods of Pregnancy. This is covered with a Filamentous and Spongy Substance, named by RUYSCH *Tunica Filamentosa*, and by more modern Authors, the *False* or *Spongy Chorion*.

The *Spongy Chorion* is described by DR HUNTER as consisting, in early Gestation, of *two Layers*; one lining the Cavity of the Uterus, and termed by him *Membrana Decidua*, from being supposed to be cast off from the Uterus; the other, covering the outer Surface of the True Chorion, he terms *Decidua Reflexa*, the one appearing to be a continuation of, or reflection from, the other; of course, four Layers or Coats are found in the beginning of Pregnancy.

The *Decidua* is least distinct between the Uterus and Placenta, being there perforated by the Uterine Vessels. Near the edge of the Placenta, the Decidua and that part of it called *Reflexa*, are thickest and strongest, and decrease in thickness towards the other end of the Uterus and Ovum, in proportion as these become more expanded.

In advanced Gestation, the inner Surface of the Decidua, and outer one of the Decidua Reflexa, gradually approach each other, and unite into one Membrane, which retains the name of *Spongy Chorion*, or *Decidua*. They have been supposed to be formed originally by an efflorescence thrown out upon the parts on which they are placed, in the manner it is thrown out upon inflamed Surfaces.

Between the Amnios and Chorion, a large proportion of *Gelatinous Fluid* is contained in the early Months, which separates them at a considerable distance from each other. At this period a small *Bag*, filled with a milky-like Fluid, is observed on the Amnios, near the insertion of the Umbilical Cord, and is termed *Vesicula Umbilicalis*, vel *Alba.*

The *Vesicula Umbilicalis* is connected to the Cord by a Filament consisting of an Artery and Vein, derived from the Umbilical Vessels, which, with the Fluid and Bag, soon disappear. The use of this Vesicle, which has sometimes been mistaken for an *Allantois*, is not yet understood.

In early Gestation the Ovum is large in proportion to the Embryo; but towards the latter period of Pregnancy, the proportion is reversed, as appears from the following observations.

No well-authenticated account has been yet received of the Embryo being observable till near the end of the third Week, when it is found to be about a line in length, and to appear like an oblong curved Vesicle floating in the Limpid Liquor of the Ovum.

In the fourth Week, the Ovum is about the size of a Pigeon's Egg, and the Embryo not larger than a common House-Fly.

At the end of the sixth Week, the Embryo is about as large as a Honey-Bee, with the Head turned forwards towards the farther extremity of the Trunk. The size of the Head, at this time, is almost equal to that of the rest of the Body. The Eyes and Mouth appear evident.

In the eighth Week, the Ovum nearly equals the bulk of a Hen's Egg, and the Embryo is about an inch in length. The Nose and Ears now begin to be visible; the Limbs extend beyond the Trunk. The cord is at this period almost as long as the Embryo, but the Vessels run parallel to each other, nor do they receive their twisted appearance till a few weeks afterwards.

About the end of the third Month, the Ovum is of the size of a Goose's Egg, and weighs about eight ounces, while the Embryo is between two and three ounces in weight, and three inches in length; and the Head and Extremities being now distinctly observable, it obtains the name of *Fœtus*, which it retains from this time till the end of Gestation.

Towards the end of the fourth Month, the motions of the Child begin to be felt by the Mother, in consequence of which the term *Quickening* has been applied.

In the sixth Month, the Placenta and Membranes weigh seven or eight ounces, the Fœtus twelve or thirteen. It is then eight or nine inches in length, and perfect in all its external parts.

In the seventh Month, the Fœtus is about a foot in length.

At birth the Secundines weigh between a pound and a pound and a half. The Fœtus is then about seven pounds, and is from eighteen to twenty inches in length. Still, however, from the difficulty of ascertaining when Pregnancy commences,—from the difference of size of Fœtuses of the same age in different Women, and in the same Woman in different Pregnancies,—and from the Fœtus being frequently retained in the Uterus some time after it is dead, as well as from the inaccuracy of many of the Figures representing these parts,—the above observations are not altogether to be depended on.

CHANGES PRODUCED IN THE UTERINE SYSTEM BY IMPREGNATION.

Immediately after Impregnation, a large *Orifice* is constantly observed in the Ovarium, leading to a Cavity in that part of it where the Rudiments of the Fœtus have been derived.

This Cavity appears first flocculent, and is afterwards filled up, during Gestation, though sometimes not till several Months afterwards, by a Granulous Substance, which has the name of *Corpus Luteum*, from the yellow appearance it assumes, especially in Quadrupeds.

The *Corpus Luteum* projects from some part of the Surface of one of the Ovaria. It is of a roundish or oval form, and consists of an outer Vascular, and inner inorganic-looking, pale-coloured Substance, which has been considered by some Authors as the remains of the Ovum.

A real Corpus Luteum is not found till after Impregnation, though diseased appearances of the Ova have sometimes been shewn as such. The Corpus Luteum continues till the end of Pregnancy, and for some time after Delivery, when it gradually vanishes, but leaves a *Scar* in the Ovarium, which continues for life. In the case of a single child, a Corpus Luteum is only found in one Ovarium; when there are Twins, a Corpus Luteum is observed in each Ovarium, or two Corpora Lutea in one Ovarium, and none in the other; the number of Corpora Lutea always corresponding with that of the Ova impregnated.

After the Embryo is received into the Cavity of the

Uterus, the Uterine Extremities of the Tubes are closed by the Membrana Decidua; the Os Tincæ is shut by a *Ropy Mucus* secreted from the Follicles in the Cervix Uteri, which excludes the Air, and prevents the chance of Abortion, or of Superfetation; the Menstrua *cease to flow*,—and the Uterus by degress is changed from a triangular to an *oval* form, though the oval appearance is not distinctly observed till the latter Months of Pregnancy.

From the influx of Blood to the Substance of the Uterus, and from the growth of the Ovum, the Cavity of the Uterus gradually enlarges, from a size capable only of admitting a decorticated Almond, to that which contains the full-grown Fœtus, the Secundines, and Waters; composing together a mass equal to nine or ten pounds in weight.

The size of the Uterus varies in different women, according to the size and number of the Fœtuses, and the quantity of Fluid contained in the Ovum.

Some time after Impregnation, the Fundus and Body of the Uterus, being softer and looser than the Cervix, first yield to the parts which it contains, but continue somewhat flat through the whole period of Gestation, in consequence of pressure from the anterior and posterior parts of the Abdomen; the fore part, however, still continuing flatter than the back part.

For the two first Months, the Uterus increases so little as to remain in the Cavity of the Pelvis; and it is generally after the third Month, before the Tumour formed by it can be felt above the Symphysis Pubis.

In the fourth Month, the Body of the Uterus is about five inches in length, and it has acquired so much additional size and weight, that it is found lower than formerly in the Cavity of the Pelvis; in consequence of which, the Os Tincæ is felt projecting nearer to the Os Externum Uteri.

After this time, its bulk increasing, it presses against the Pelvis, and ascends in the Abdomen, carrying the Os Tincæ higher than its original situation; at the same time elongating the Vagina.

In the fifth Month, the Uterus renders the Abdomen tense, and forms a sort of Ball between the Pubes and Umbilicus.

In the sixth month, it extends about four inches above the Pubes, the length varying according to that of the Abdomen and Ovum.

It continues to rise through the whole remaining period of Gestation; and after ascending above the Pelvis, it commonly inclines, with its Fundus forwards, the Os Tincæ backwards, and is frequently also turned a little to one side; but the ascent is observed to be more in the first, and the inclination greater in the later Gestations, owing to the nature of the Integuments of the Abdomen, less resistance being made by them after a Woman has born a number of Children.

The position of the Uterus also varies according to the height of a person, and the width of the Pelvis.

In the seventh Month it reaches the Umbilicus; in the eighth is half way between that and the Sternum. At last it touches the Scrobiculus Cordis, Stomach, and Colon, being now about a foot in length from the upper to the under extremity; occupying almost the whole of the Umbilical and Epigastric Regions, and having the Omentum and Intestines at the upper, lateral, and posterior parts of it, the fore side of the Uterus being in close contact with the Parietes of the Abdomen.

In the progress of Gestation, the whole Uterus becomes softer and looser, in consequence of which it readily changes its form, and accommodates itself to the pressure of the Child, or of any of the adjacent Viscera. It now becomes also more Vascular, and the Vessels are greatly enlarged in size; the proportional increase being nearly similar to that of the bulk of the Uterus.

The Arteries are now observed to have very frequent communications, and in their course to be remarkably convoluted,—fully as much so as they are previous to Conception,—and greatly more so than the corresponding Veins.

The Veins are much larger than the Arteries, their diameters being such as to have distinguished them formerly by the name of *Sinuses*;—and to them the great bulk of the Uterus is chiefly owing.

The Lymphatic, like the Sanguiferous Vessels, are also much increased in size, as well as in number, towards the latter period of Pregnancy. Many of them are larger than Crow-quills. They form a Plexus, which covers a great part of the Body of the Uterus.

The Substance of the Uterus was formerly supposed by some to be thicker, and by others to be thinner, in the Gravid, than in the unimpregnated state; but it appears now to be fully ascertained, that it is nearly of the same thickness in both states, and during the whole term of Pregnancy, excepting at the end of Gestation, when it becomes thinner towards the under extremity. For several days after Delivery, on the contrary, it is observed to be much increased in thickness, especially at its Fundus.

After the third Month, the Cervix Uteri begins to become softer, wider, and more Spongy, and continues to do so till the seventh or eighth Month, when it is so expanded as to form part of the Body of the Uterus.

During all this period, the Os Tincæ is undergoing similar changes. In proportion as the Cervix stretches, the Tubercle of the Os Uteri becomes less prominent, but its circumference is enlarged. At the latter Months it becomes thin, flat, and irregular on its edges, and the firmness of its texture is converted into the Spongy softness of the Body of the Uterus. Its Orifice is changed from a Transverse Slit into an Oval Pit; and in Women who have born several Children, it is considerably dilated near the end of Gestation. There is now merely the Mucus as a Septum between the Uterus and Vagina; this comes away before Parturition, along with the Liquor Amnii, the Follicles which form this Mucus throwing out, afterwards, a thinner fluid, to lubricate the parts.

The situation of the Appendages of the Uterus is also considerably altered. The Ovaria, with the Tubes and Ligaments of the Uterus, are situated lower, in respect to the Fundus Uteri, in proportion as it ascends, and at the full time lie close upon its Surface. The Round Ligaments are thicker and more Vascular, and the Ligamenta Lata, by assisting in forming a Covering to the Uterus, are nearly obliterated.

The Tubes descend by the sides of the Uterus; are straighter, thicker, and more Vascular; have the Muscular-like Plicæ more distinct, and the Fimbriæ more expanded than formerly.

In the enlarged state of the Uterus, the Muscular Fibres, though pale, are distinctly seen. They form Fasciculi which run in different directions, but cannot be traced far without interruption. They are variously described by different Authors; their course, however, is such, that they are capable of contracting the Uterus in all its dimensions during the time of Delivery.

According to Dr Hunter, the contractile power of the Muscular Fibres of the Uterus is in some parts slow, but in others quick; in some parts voluntary, and in others involuntary.

A description is given by Ruysch of a *Circular Muscle* in the bottom of the Uterus, for the expulsion of the Placenta;—but the Placenta is found to adhere to other parts besides the Fundus Uteri; nor has such a Muscle been observed by later Anatomists. In Dr Hunter's Plates, the Fibres are seen running transversely in the Body of the Uterus, and describing Concentric Circles about the Orifices of the Fallopian Tubes.

The Muscular Fibres of the Uterus assist in the Delivery of the Child, and expulsion of the Placenta; and in a few weeks after Delivery, the Uterus, partly by the contractile powers of these Fibres, and partly by that of the Blood-vessels, is restored to near its former dimensions.

Contents of the Uterus about the End of Pregnancy.

The Contents of the Uterus, towards the end of Pregnancy, consist of the *Fœtus*, the *Umbilical Cord*, *Placenta*, *Membranes*, and *Waters*, all of which are discharged at each Delivery.

The Cord, Placenta, and Membranes, are named the *Secundines*, or *After-birth*, with which some include the Waters, though these are discharged previously to the expulsion of the Child.

The *Cord* is fixed by one end to the Umbilicus of the Fœtus, and by the other it is attached to the Placenta, at a little distance from the middle of this Organ; from which last circumstance the extraction of the Placenta is more easily effected.

It is commonly about two feet in length,—sometimes considerably shorter, and often much longer; but in general it is sufficiently long to allow the Birth of the Child, while the Placenta adheres to the Uterus of the Mother.

Its thickness is nearly equal to that of one's Finger, but it is smaller and weaker at the extremity next the Placenta. It is seldom of a Cylindrical form, being marked with Sulci corresponding to the course of its Vessels.

It is composed of *two Arteries* and *one Vein*, the Vessels running in a spiral direction, like the twisting of a rope; in consequence of which the impetus of the Blood is broken in its course to the Child, or to the Placenta.

The Arteries, especially in cases where they have run some way in a straight course, or where they are of unequal length, frequently form short Coils upon themselves. Sometimes there is a knot upon the Cord. Now and then the Navel String forms one or more turns about the Neck of the Child. Sometimes, though very rarely, there is only a single Artery.

The Trunks of the Vessels are not provided with that strong external covering belonging to the Blood-vessels in other parts of the Body, but are inclosed in a *Gelatinous, Ropy, Cellular Substance,* which adds to the strength and elasticity of the Cord, and allows the Blood to pass freely between the Fœtus and Placenta, without being in danger of interruption from pressure.

The *Vein* is much larger than the Arteries, its area being about equal to the area of both of these. It is destitute of Valves, and sends off no branches while running in the Cord.

It arises from the Substance of the Placenta, and, after perforating the Umbilicus, it passes in the inferior part of the Ligamentum Suspensorium, to the under side of the Liver.

The *Arteries* arise from the Iliac Arteries of the Fœtus, perforate the Umbilicus, and run to the Placenta, in the Substance of which they divide into their ultimate Branches, but send off no Ramifications in their course through the Cord. When they reach the Placenta, the Trunk of the one Artery frequently forms a large Anastomosis with that of the other, and the Ramifications of the Arteries communicate with those of the Vein, in the manner Arteries and Veins do in other parts of the Body.

The Cord, by means of the Vein, conveys pure Blood, of a Vermilion colour, from the Placenta, for the nourishment of the Fœtus, and, through the medium of the Arteries, returns what is not used in Nutrition, and which is here of a purple colour, again to be mixed with the Blood of the Uterus.—By the intervention of the Cord, also, the Placenta is more readily extracted.

The *Placenta*, or *Cake*, or *After-birth*, is a Spongy Mass, of a round form, though sometimes oval, or oblong, occupying nearly a fourth part of the Ovum, and is common to the young of many other Animals.

It is about seven or eight inches in breadth, and upwards of one inch in thickness, though nearly the double of that when minutely injected; but is thinner at the edges where the Membranes go off. While attached to the Uterus, it is concave next the Child, and convex towards the Womb.

The external Surface, or that next the Uterus, is divided into Lobules with Fissures between them, while the Internal, or that next the Fœtus, forms a regular Mass, which has numerous large Branches of the Umbilical Vessels spreading out upon it in a radiated manner, and afterwards plunging into its Substance. After a good injection of the Blood-vessels of the Placenta, we observe,—on the side next the Child,—the Ramifications of the Umbilical Vessels, forming the principal part of its Substance;—on the side next the Mother,—Branches of the Uterine Arteries, almost of the size of Crow-quills, passing in a convoluted manner between the Uterus and Placenta, and terminating in the latter;—Veins corresponding with these Arteries, but flat and of great size, running obliquely from the Placenta to the

Uterus,—and, in the Substance of the Placenta, an appearance which has been supposed by many Authors to be common Cellular Membrane, of a tender nature, and easily ruptured by Injection, but which is considered by late Writers as a regular Spongy Substance, similar to that in the Body of the Penis, and, as in that Organ, the Cells communicating freely with each other.

The Placenta is connected to the Uterus on one side by Blood-vessels and by the Decidua, and to the Fœtus on the other, by means of the Umbilical Cord.

The common place of attachment is near the Fundus Uteri; though it is found at different times adhering to all the other parts of the Uterus, not even the Os Tincæ excepted.

In the case of Twins, there is sometimes only one, but most frequently two distinct Placentæ, adhering together by the intervention of a Membrane in which the Vessels of the two Placentæ occasionally communicate with each other.

There are in this case also two distinct sets of Membranes, which form two Apartments, separated by a Partition; each Apartment containing its own Fœtus, Waters, and Cord.

The Placenta receives Blood from the Uterus for the nourishment of the Fœtus, and, according to the opinion of modern Anatomists, purifies the Blood, in the same manner as the Lungs do in the Adult. In proof of which it is observed, that the Blood passing through the Umbilical Vein to the Child is of a pure Vermilion Colour, while that returning by the Arteries to the Placenta is purple, and has all the other qualities of Venous Blood.

SCHREGER supposes that the Uterine Arteries secrete a Serum, which is discharged into Cells in the Placenta, and that this is absorbed by Lymphatic Vessels existing in the Placenta and Umbilical Cord.

Dr Lavagni has found, that the Blood collected from the Umbilical Vein contains a considerable proportion of Fibrin, while that from the Umbilical Arteries contains a very small one, from which he concludes, that the Uterus, in a gravid state, acquires the power of furnishing Blood provided with Fibrin, which is abstracted from it by the Embryo, for its own use.

The *Membranes* consist of the *Spongy Chorion*, or *Decidua*, the *True Chorion*, and the *Amnios ;* and these are so closely connected to each other, as to appear at first sight as a single Layer; but they can be readily peeled off from each other.

The Placenta and Membranes form a complete *Bag*, which lines the Cavity of the Uterus, and incloses the Fœtus, Umbilical Cord, and Waters.

The *Spongy Chorion* is a thick opake Substance, which adheres to the inner Surface of the Uterus, but separates from it at each Delivery. It forms the outer Layer of the Ovum, but scarcely penetrates between the Lobules of the Placenta, though, in the early Months, it enters more into the composition of that Substance.

Between the Uterus and Placenta it is less distinct than elsewhere, being perforated there, and in some degree concealed by the Blood-vessels proceeding from the inside of the Uterus.

It has a Spongy and Villous appearance, and is full of small Blood-vessels, which can be readily injected from those of the Uterus.

The *True Chorion* is thinner, smoother, and much denser, than the former, and is connected with the Spongy Chorion as far as the edge of the Placenta, where it separates from it. It is next reflected over that Surface of the Placenta which is opposed to the Fœtus, and is afterwards continued over the whole of the Cord, and terminates at the Umbilicus.

It is uniform in its texture, has a transparent appearance, adheres to the Spongy Chorion and Surface of the Placenta by a delicate Cellular Substance, and has no Vessels visible to the naked Eye, or which can be injected.

The *Amnios* lines the whole Surface of the True Chorion, and, with it, is reflected from the Placenta over the whole length of the Cord, which it supplies with an external Covering.

It is thinner, (but at this period stronger), more dense, and transparent, than the Chorion, to which it adheres every where by a tough Jelly.

It is smooth and polished on the side next the Fœtus, and is destitute of Blood-vessels.

The Membranes, besides containing the Child and Waters, give origin to the latter, and, in the time of Labour, assist in opening the Orifice of the Uterus.

The *Waters*, called *Liquor Amnii*, are thinnest and clearest in the first Months, after which they acquire some degree of colour and ropiness.

The *Liquor Amnii* is chiefly composed of the Serum of the Blood. It has a slight whitish or yellowish tint, a weak pleasant odour, and a saltish taste. In its natural state, it has all the characters of the Liquor Pericardii, or of the Liquors exhaled from the Surfaces of other Membranes similar to the Pericardium. According to late Experiments, it consists, in 100 parts, of 98.8 of Water, the remaining 1.2 parts being Albumen, Muriate of Soda, Soda, Phosphate of Lime, and Lime. —It is supposed to be derived from the Exhalent Arteries of the Amnios.

It is proportionally greater in quantity in the first than in the last Months; at the full time there are generally about a couple of pounds; the proportion and quantity varying considerably in different Women, and in the same Woman in different Pregnancies.

Between the Amnios and Chorion, Water is frequently collected, but in much smaller quantity than in the Amnios, and is termed *False Water* or *False Delivery*. —It is commonly discharged before the Birth of the Child. It frequently comes away some days previous to this without any danger.

The Liquor Amnii defends the Child and Umbilical Vessels from the pressure of the Uterus, assists in distending the Uterus during Gestation, and allows the Fœtus a certain degree of motion; but forms no part whatever of the nourishment of the Child, that being accomplished entirely by the Blood from the Umbilical Vein. Nor does it appear that any part of the Liquor Amnii is swallowed by the Child, as full-grown Fœtuses have in different instances been born without a Mouth.

In the time of Labour, it also assists in dilating the Mouth of the Uterus, and, by lubricating the Vagina, facilitates Delivery.

POSITION OF THE FŒTUS.

In the first Months, the Embryo swims in the Liquor

Amnii, free from the pressure of the surrounding parts;—and from many Dissections and Observations made by the latest Anatomists, it is ascertained that the Head preponderates, and in general continues undermost during the whole time of Gestation.

Formerly it was supposed that the Embryo, in the first Months, was situated with the Head uppermost, and that, in the later Months, the attitude of the Fœtus was inverted.

The Fœtus, towards the end of Gestation, is observed to be coiled up into an oval form, so as to be properly adapted to the Cavity of the Uterus.

The Head is bent towards the Thorax, and the Arms are folded:—The Knees are drawn towards the Abdomen, and the Heels towards the Nates.

The Spine is bent into an Arch, and one side of the Body of the Fœtus is frequently turned forwards.

The Head is placed diagonally, with its long diameter corresponding to that of the Pelvis, and the Occiput opposed to the Os Tincæ.

PECULIARITIES OF THE FŒTUS.

All the Bones of the Fœtus, excepting a few, are *soft*, *yielding*, and *imperfect*, and many of them entirely in a *state of Cartilage*. The Gelatin is observed to be in greater proportion than in Adults, in whom the Cartilage and Earthy Matter predominate.

The Bones of a Fœtus are uniform on their Surface, while those of an Adult are marked by the Muscles. Their Internal Cavities, at this period, are filled with a Jelly, in place of Marrow.

The Head is *large* in proportion to the rest of the

Body, and the Bones of the Cranium are united by *Membrane*, which admits of some alteration in the form of the Head, whereby its Passage is facilitated in the time of Delivery.

The Cranium bears a large proportion to the Face in the Child, owing to the size of the Brain, and the want of Sinuses in the Head, and of Teeth in the Jaws; and the younger the Embryo is, the greater is the disproportion between the Head and the rest of the Body.

Between the Frontal and Parietal Bones, is the space called *Bregma*, formed of a quadrangular Membranous Substance, which commonly disappears before the Child is two years of age, the margins of the Bones being then united.

Between the middle of the Lambdoid, and posterior extremity of the Sagittal Suture, a Membrane of a triangular form is also described, and termed *Posterior Bregma*; but this does not exist in the Head of a sound and healthy Child.

—The other Peculiarities of the Bones of a Fœtus are taken notice of along with the description of the Bones of an Adult.—

The Fluids, in a Fœtus, are proportionally *larger* in quantity, and the solids generally *softer*, than in an Adult.

The Skin is of a *bright red colour*, in consequence of its greater degree of Vascularity, and is covered with an Unctuous Substance, which forms a Soap with Alkalis, and is supposed to be secreted from the Vessels upon its Surface.

That part chiefly of the Cellular Membrane is *Adipose*, which is near the Surface of the Body; scarcely any Fat being found in the more interior parts, till a Person arrives at a considerable time of life, when it afterwards gradually accumulates.

The Brain, Spinal Marrow, and Nervous System, are proportionally *larger*, but *softer*.

The Sanguiferous System, and Glandular Organs, are *larger*.

The Cornea is *thicker*, and somewhat more *prominent*.

The Pupil of the Eye, in a young Fœtus, is occupied and completely covered by the *Membrana Pupillaris*, which arises from the inner margin of the Iris, and continues there till the seventh Month, when it gradually vanishes, in consequence of being absorbed. It is a very vascular Substance, and separates the two Cameræ from each other. According to BLUMENBACH, it keeps the Iris expanded during the rapid increase of the Ball of the Eye.

The Crystalline Lens is almost *Spherical*, and has numerous *Vessels* dispersed upon its Capsule.

The Meatus Auditorius is wholly *Cartilaginous*, and adheres by its extremity to an imperfect Ring of Bone, in which the Membrana Tympani is placed. The Membrane itself is more on a level with the side of the Head than in an Adult, and the Meatus being shorter, is more in danger of receiving injury.

The Meatus Externus, and Membrana Tympani, are lined by a *Mucous Membrane*, which is cast off after Birth.

The Mammæ of a Fœtus in both Sexes are in the form of Tubercles, from which a Fluid contained in them may be readily squeezed out.

The Thymus Gland, in a Fœtus, is a *large* Substance, situated in the upper part of the Thorax, between the Layers of the Anterior Mediastinum.

It lies over the top of the Pericardium, and upon the Arch of the Aorta, the roots of the Carotid and Subclavian Arteries, and extends a short way into the fore part of the Neck.

It has *two Long Cornua* above, and *two Broad Lobes* below; is of a pale red colour, and becomes afterwards of a darker hue.

A *white Serous Liquor* can frequently be pressed from its Substance; but it has never yet been observed to have any Excretory Duct; nor is the use of the Fluid, nor of the Gland itself, yet ascertained.

Some Anatomists are of opinion, that the white Fluid is Chyle sent by a retrograde motion from the Thoracic Duct, and that the Thymus Gland is a Diverticulum to the Chyle, when too great a quantity of Lymph is sent to the Subclavian Vein.

Part of the Thymus Gland frequently remains distinct in young Adults; but in Persons advanced in life, it is so completely absorbed, that scarcely any thing but Cellular Substance remains in its place.

The Blood-vessels of the Thymus are Branches of the Subclavian and Internal Mammary; the Nerves come from the Great Sympathetics and Eighth Pair.

Its Lymphatics have not yet been very accurately traced.

The Lungs are small, firm, and dense, of a dark red colour, their weight to Water is as 22 to 21; they therefore *sink* when thrown into it, in consequence of the Bronchial Cells having not yet received Air, no Respiration taking place in the Womb. But if Air be admitted to them, by Putrefaction or otherwise, they *swim* in Water, in the same manner as if Air had been conveyed to them in consequence of Respiration.

From the observations of DR Hunter on the uncertainty of the signs of murder in cases of concealed Labours, published in the 6th Volume of Medical Observations and Inquiries, it appears, that when Air has been respired, the Air-bubbles are hardly visible to the naked eye, while, in cases of Air existing in the Lungs from Putrefaction, the Air-bubbles are large, and are apt to run in lines between the Lobules of the Lungs;

That if a Child make but one gasp and instantly dies, the Lungs will swim in Water as readily as if it had breathed longer, and then been strangulated;

That a Child will very commonly breathe as soon as its Mouth is protruded from the Mother, and in that case may lose its life before its Body is born, especially in tedious Labours; that children are frequently born, who, from circumstances in their Constitution, or in the nature of the Labour, are but barely alive, and after breathing a short time die, in spite of all attention.

That when a Woman is delivered by herself, a strong Child may be born alive, and die in a few minutes from Suffocation, either by being upon its Face in a pool made by the natural discharges, or by wet cloths collapsing over it, and preventing it from breathing.

The Heart, in a Fœtus, is proportionally larger and more conical than in a full-grown Person. The Valve of EUSTACHIUS is *distinct* and *entire*, though frequently Cribriform in an Adult; is *larger* in proportion, and is supposed to direct the principal part of the Blood of the inferior Cava directly through the Passage termed Foramen Ovale to the Left Auricle.

In the back part of the Septum, between the Right and Left Auricles, is the *Foramen Ovale,* nearly equal in size to the Mouth of the inferior Cava, bounded by a thick Muscular edge, termed *Annulus Foraminis Ovalis.*

The Foramen Ovale is placed obliquely, and has a Membrane, forming a distinct Valve, somewhat of a Crescentic form, upon the left side of it, which allows part of the Blood of the Right Auricle to pass through this opening directly to the Left Auricle, but which completely prevents its return.

The Blood going through the Foramen Ovale, assists in keeping up the balance of Circulation between the two sides of the Heart, till the Lungs are ready to receive it.

The Pulmonary Artery divides into three Branches, the right and left of which run to the Lungs, while the middle one, called *Ductus Arteriosus,* larger than both the other Branches, and its Area nearly equal to that of the Foramen Ovale, passes in an oblique direction to the beginning of the descending Aorta.

The Ductus or Canalis Arteriosus, forms nearly one half of the Aorta, carries part of the Blood of the Right Ventricle into that Artery, without allowing it to pass to the Lungs, and thereby assists the Foramen Ovale in keeping up the balance of Circulation till the Child has breathed; and the Aorta, formed in this manner, receives the force of both Ventricles, by which it is more enabled to drive the Blood through the Umbilical Arteries to the Placenta.

The Abdomen is proportionally larger and more prominent on account of the bulk and nature of its contents, and the Diaphragm is straighter or less convex towards the Thorax.

The Stomach is of a *rounder* form than in an Adult, and commonly contains a small quantity of *Gelatinous Matter*.

The Omentum has a much smaller quantity of Fat between the Layers of which it is composed, than is found in an Adult.

The Valvulæ Conniventes on the inner side of the Small Intestines are only beginning to appear. The Appendix Vermiformis is *larger* in proportion, and is inserted into the extremity of the Colon, which at this time does not project to form a proper Cæcum.

The Longitudinal Muscular Bands of the great Intestines are less distinct in a Fœtus. The Colon, and frequently also the end of the Ilium, are filled with a *greenish-black Fæces*, of a viscid consistence, termed *Meconium*, which is considered to be a mixture of the Bile with Secretions from the Intestines.

The Liver is so *large* as to occupy both Hypochondriac Regions, and to extend some way beyond the Margin of the Thorax. The Right and left Lobes are more nearly of an equal size than in an Adult.

The Gall Bladder is filled with a fluid of a dark green colour and bitter taste.

The *Umbilical Vein* passes from the Umbilicus, in a Duplicature of the Peritoneum, behind the Recti Muscles, to the Fossa Umbilicalis of the Liver, and thence to the Left Branch of the Vena Portæ, and carries the Blood from the Placenta to the Liver.

From the Trunk of the Umbilical Vein, where it terminates in the Liver, a Branch called *Ductus* vel *Canalis Venosus*, runs in a somewhat waving direction, and joins the Left Vena Hepatica, where that Vein enters the Cava.

The Ductus Venosus is much smaller than the Trunk of the Umbilical Vein, and carries part of the Blood of that Vein directly to the Heart, without allowing it to enter the Circulation in the Liver.

The Umbilical Vein sends Branches to the Right Lobe of the Liver, but is principally distributed through the Left Lobe; while the Right Branch of the Vena Portæ carries the principal part of the Blood of the Splenic and Mesenteric Arteries to the Right Lobe of the Liver, a small portion only going to the Left Lobe by the corresponding Branch of the Vena Portæ.

After Birth, the Left Lobe of the Liver, which was formerly more particularly supplied by the Umbilical Vein, receives an additional proportion of Blood from the Vena Portarum.

The reason why the Umbilical Vein goes partly to the Cava, and not entirely to the Heart, is not understood.

The Pancreas, like the other Glandular Viscera, is also somewhat enlarged in size.

The Kidneys are irregular on their Surface, being formed of *Lobes*, the number nearly corresponding with that of the Papillæ in the Kidney of an Adult.

Each of the Lobes consists of a Cortical and a Medullary part, with a Papilla, and is covered by a proper Membrane.

The Glandulæ Renales are almost *as large* as the Kidneys, but afterwards rather diminish than increase in size.

The Pelvis of a Fœtus is commonly so *small*, that the principal parts of the Viscera afterwards lodged in it, are at this time contained in the Cavity of the Abdomen. The longest diameter of the Pelvis is between the Ossa Pubis and Sacrum.

The Bladder of Urine is of a *long* form, and extends almost to the Umbilicus. The greater part of it is above the Pelvis, and is more particularly covered by the Peritoneum than in an Adult. The Urethra arises more directly from the lower extremity of the Bladder than in a full-grown person.

The Muscular Coat of the Bladder is proportionally a little thicker and more irritable than in an Adult, in consequence of which the Urine is voided more frequently, and with greater velocity, in a Child.

The Urachus, which is of a *Conical form* and *Fibrous texture*, ascends from the bottom of the Bladder, between the Umbilical Arteries, and between the Peritoneum and Linea Alba, to the Umbilicus, and vanishes by degrees in the Umbilical Cord.

It is formed by a production of the Fundus Vesicæ, and in a Human Body is a solid Substance, constituting a Suspensory Ligament of the Bladder.

It has been sometimes found hollow at its beginning, and has been said to be so, in one or two instances, throughout its whole length.

In a Fœtal Quadruped, it is a large Tube, which transmits Urine from the Bladder to a Bag called *Allantois*, placed between the Amnios and Chorion.

The common Iliac Arteries divide, on each side, into a *small* External, and *large* Internal Branch, in consequence of which, the lower Extremities are less in proportion than in an Adult.

The principal part of the Internal Iliacs is occupied in forming the *Umbilical Arteries*, which mount by the sides of the Bladder, on the outside of the Peritoneum, and perforate the Umbilicus in their progress to the Umbilical Cord.

Soon after Delivery, the Foramen Ovale, Ductus Arteriosus, et Venosus, with the Umbilical Vein and Arteries, begin to contract, and are, in general, completely closed, and the Vessels shrivelled into Ligaments, within a year after Birth, though sometimes one or more of them remain open to a much later period.

This obliteration is produced by a contractile power in the parts, by the pressure of the surrounding Viscera, and by the Blood being directed through other channels.

The Testes are lodged, during the greater part of Gestation, in the Cavity of the Abdomen, over the Psoæ Muscles, and a little below the Kidneys.

They constitute a part of the Abdominal Viscera, and, in a similar manner with them, are connected to the Body by a Production of the Peritoneum, which forms their Tunica Albuginea.

The Epididymis is placed more upon the back part of the Testicle, and is proportionally larger than in an Adult.

Between the Testicle and Scrotum, a Fibrous and Vascular Substance is extended,—called by MR HUNTER, *Gubernaculum*, vel *Ligamentum Testis*, which he considers as a principal agent in directing the course of the Testicle, and in making way for it in its descent.

The Ligamentum Testis is of a conical form, with the large end upwards, and fixed to the under part of the Testis and Epididymis, while the Lower Extremity is attached to the inner side of the Scrotum.

About the Eighth Month of Pregnancy, the Testis, by means not yet completely ascertained, passes gradually along to the Scrotum, a Process of the Peritoneum preceding it, which afterwards forms its Vaginal Coat.

Sometimes one or both Testes remain several Weeks after Birth in the Groins; and cases have been found where they have continued during life in the Abdomen.

The Testis, through the whole of its course, continues to be covered by the Peritoneum, is connected to the parts on which it rests, and has its Vessels passing to it from behind forwards, the same as when situated in the Abdomen.

While the Testicle is advancing through the Rings of the Abdominal Muscles, the Ligamentum Testis is found to be in some measure inverted, and to form the under and fore part of the Vaginal Coat, on which the Cremaster is expanded.

After the descent of the Testicle, the Peritoneal Process, which accompanies it, begins to contract at the under Abdominal Ring; and a firm adhesion of its sides, to within a little distance of the Testicle, is commonly found to be produced by the time of Birth, though in some cases it remains open during life.

The Prepuce of the Penis is so long in a Fœtus, as not only to cover the Glans, but to extend some way beyond it.

The Uterus is proportionally longer, and the Fundus Uteri, with the FALLOPIAN Tubes and Ovaria, much higher in the Abdomen than in an Adult, the

Ovaria at this time having nearly the same situation with the Testes in a Male.

The external Abdominal Ring in a Fœtus has nearly the same situation with respect to the Crest of the Pubis, as in an Adult Body; but at this time the upper and under Rings are opposite to each other, and almost in contact.

By degrees the Upper Ring changes its position, and is situated nearer the Anterior Spinous Process of the Os Ilium, the Abdominal or Inguinal Canal increasing gradually in obliquity and length, as the Pelvis increases in wideness.

The prepuce of the Clitoris is proportionally so much *larger* in a young Fœtus than it is afterwards, that, in an Abortion, a Female Fœtus has frequently been mistaken for a Male.

CIRCULATION OF THE BLOOD IN A FŒTUS.

The Blood is sent by the Arteries of the Uterus to the Substance of the Placenta, from which, according to the opinion of most of the ancient Anatomists, it passes to the Umbilical Vein by a direct communication of Branches; or, according to that of the greater part of modern Authors,—by Absorption.

By the Umbilical Vein, it goes principally to be circulated in the Liver; a small portion of it passing by the Ductus Venosus to the right Auricle of the Heart.

The Blood sent from the Inferior Cava is transmitted first to the Right Auricle, then the larger portion of it goes by the Foramen Ovale, directly to the left Auricle; while the rest of it, with that of the Superior Cava, is transmitted to the Right Auricle and Ventricle, and from thence to the Pulmonary Artery.

From the Pulmonary Artery one portion of it passes by the Right and Left Pulmonary Branches, through the Lungs, as in an Adult, and another goes by the Ductus Arteriosus to the Aorta Descendens.

From the Lungs it is returned by the Pulmonary Veins to the Left Auricle, where it mixes with that coming from the Right Auricle by the Foramen Ovale. It goes through the Foramen Ovale in such proportions, as to allow equal quantities of Blood to circulate through the right and left sides of the Heart at the same time. The Blood is afterwards sent by the Aorta to the different parts of the Body, to be returned by the Veins.

From the Iliac Arteries, it is conveyed by the Umbilical Arteries to the Substance of the Placenta, where one portion of it returns by corresponding Veins to the Fœtus, the rest going to the Uterus in the manner it was discharged from the Uterine Arteries to the Branches of the Umbilical Vein.

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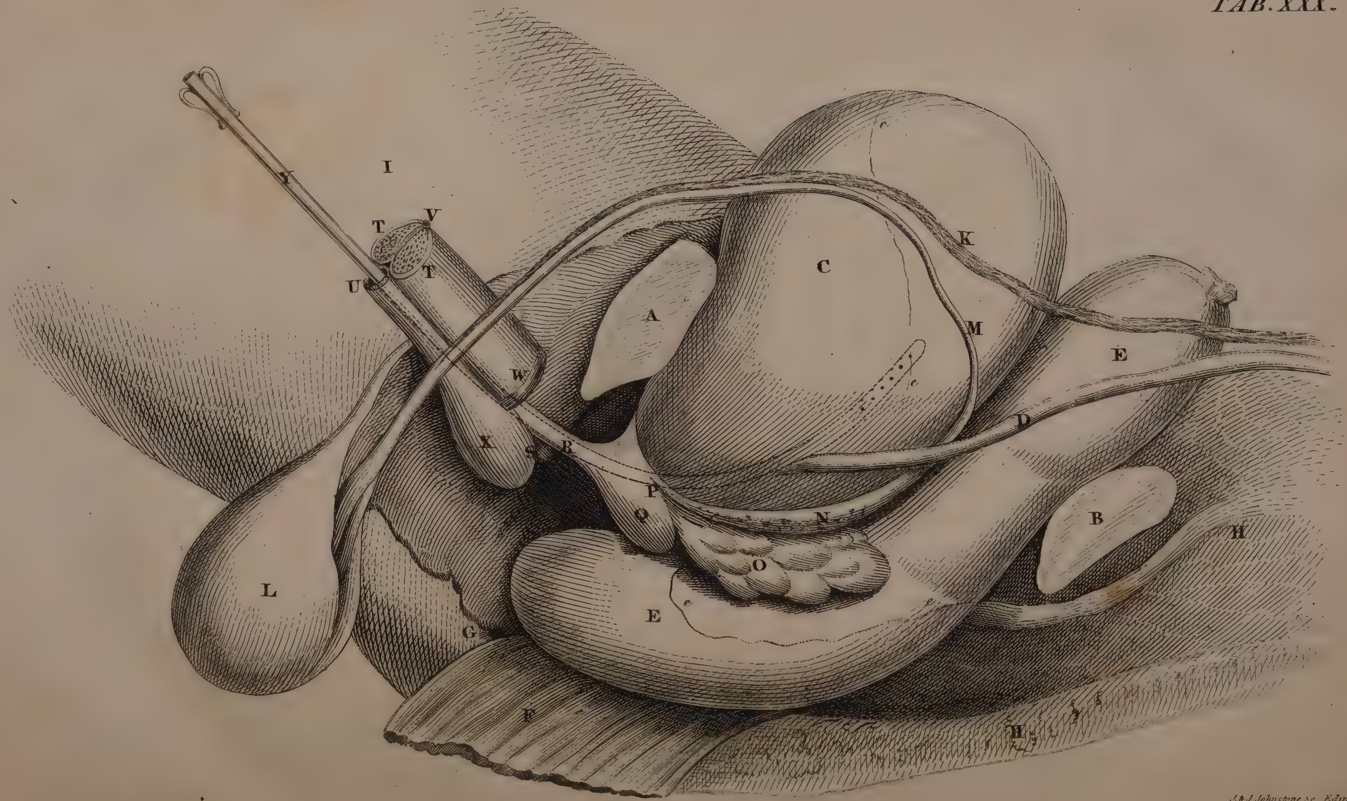
TAB. XXX.



J.&J. Johnstone sc. Edinr.

TABLE XXX.

Gives a Side View of the CONTENTS of a MALE PELVIS, in the distended state, after removing the LEFT OS INNOMINATUM and THIGH.

A, The symphysis of the pubis.

B, The joint of the os sacrum with the os ilium.

C, *c*, The bladder of urine inflated, rising a considerable way above the pubes. *c*, The extent of the peritoneum upon the bladder, in the distended state of that viscus.

D, The ureter, with its termination in the bladder.

E, E, *e*, The intestinum rectum. *e*, The peritoneum descending to the bottom of the pelvis.

F, The levator ani turned aside.

G, The fore part of the anus.

H, H, The fleshy parts of the loins, with the integuments.

I, The right thigh.

K, The spermatic blood-vessels.

L, The left testicle, covered by the scrotum.

M, The vas deferens.

N, The vas deferens enlarging and becoming cellular towards its extremity.

O, The left vesicula seminalis.

P, The beginning of the ductus communis seminiferis.

Q, The prostate gland, surrounding the neck of the bladder.

R, The membranous part of the urethra.

S, One of COWPER's glands.

TABLE XXX. CONTINUED.

T, T, A section of the corpora cavernosa penis.
U, A section of the corpus spongiosum urethræ.
V, The cut end of the vena magna penis.
W, A section of the left crus of the penis.
X, The bulb of the urethra.
Y, A catheter introduced through the urethra into the bladder.

TAB. XXXI.

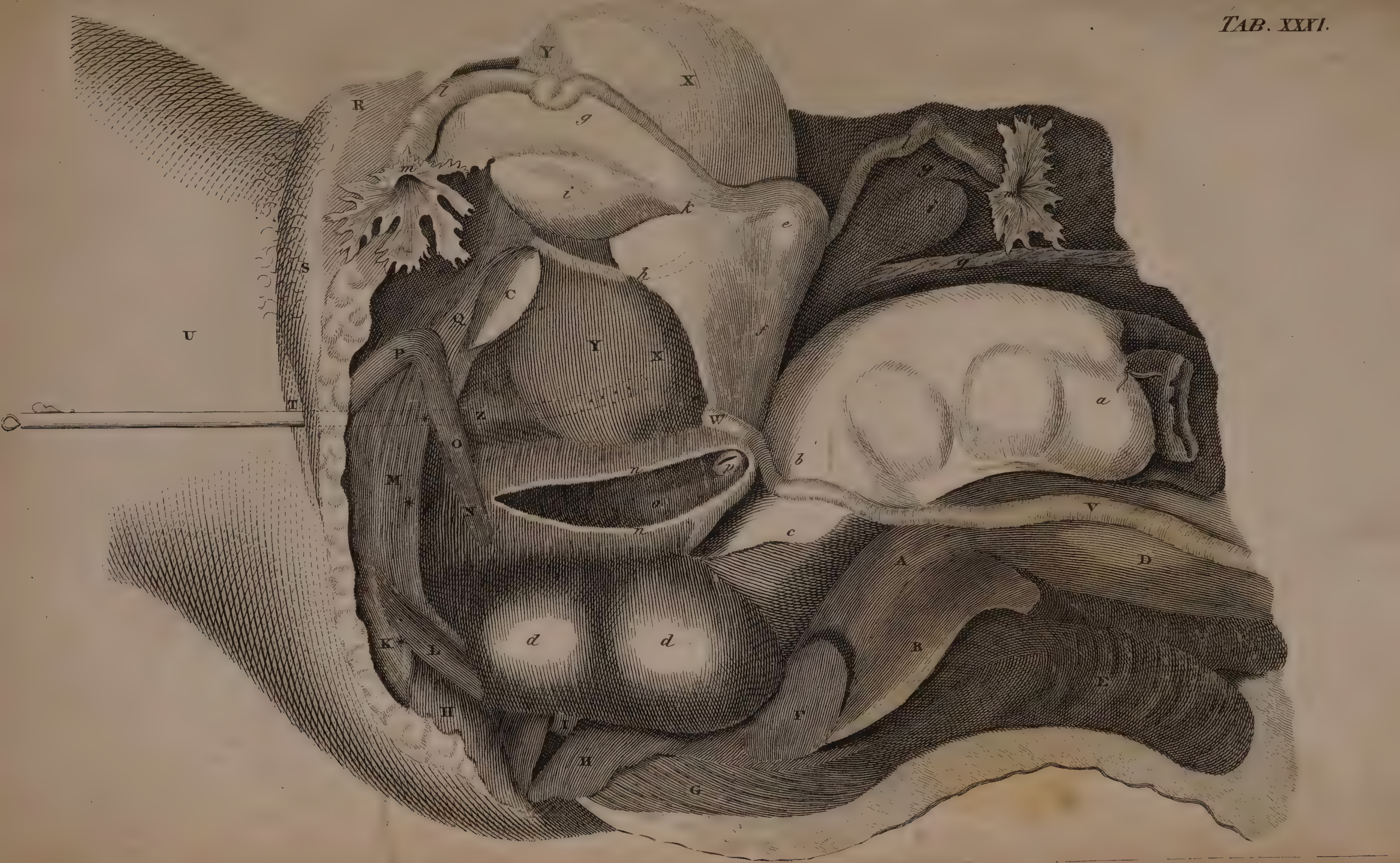


TABLE XXXI.

A Side View of the CONTENTS of the PELVIS in a Young Female, the Left Os INNOMINATUM and THIGH being separated

A, The anterior surface of the os sacrum, covered by cellular substance.
B, The cartilaginous surface of the os sacrum, which was joined to the os ilium.
C, The cartilaginous surface of the right os pubis, which formed part of the symphysis pubis.
D, The large psoas muscle.
E, A section of the muscles placed in the back part of the loins.
F, A section of the pyriformis.
G, A section of the glutei.
H, The levator ani raised from its origin, and turned back, with a cut in it to shew,
I, The point of the os coccygis.
K, Part of the sphincter ani.
L, The transversalis perinei separated from the os ischium.
M, The sphincter vaginæ covering the corpus cavernosum vaginæ.
N, The erector clitoridis.
O, The left crus clitoridis.
P, The body of the clitoris, and the angle which it forms with its crus.
Q, The suspensorium clitoridis.
R, The mons Veneris.

TABLE XXXI. CONTINUED.

S, The left, and,

T, A part of the right labium pudendi.

U, The right thigh.

V, The left ureter.

W, Its termination in the bladder.

X, X, The bladder of urine moderately distended, and covered above and behind by the peritoneum.

Y, Y, The fleshy surface of the bladder.

Z, The urethra, with a catheter introduced into the bladder.

a, *b*, The end of the colon and the intestinum rectum distended, resting upon the lumbar vertebræ and top of the os sacrum.

c, The cut edge of the peritoneum, and its depth in the pelvis, in this state of the viscera.

d, The fleshy surface of the rectum.

e, *f*, The posterior surface of the unimpregnated uterus, which is drawn upwards so as to bring it fully into view; *e*, its body; *f*, its cervix.

g, *g*, The ligamenta lata drawn upwards; the left, with the parts connected to it, is expanded upon the side of the bladder; the right, with the parts it includes, is turned backwards upon the side of the pelvis.

h, The left ligamentum rotundum uteri obscurely seen.

i, *i*, The two ovaria, with their flat upper, and rounded under edges.

k, The left ligamentum rotundum ovarii.

l, *l*, The uterine tubes; their shape and size are distinctly seen, in consequence of their having been drawn in the distended state.

m, *m*, The external orifices of the tubes, with the fimbriæ surrounding them, which are spread out, and considerably longer at one side of the tubes than at the other.

n, *n*, The vagina cut open.

o, The inside of the vagina, with its transverse rugæ, which are most numerous towards its outer extremity.

p, The os tincæ placed transversely at the posterior part of the vagina.

q, The spermatic blood-vessels of the right side.

* * * are placed opposite to the external orifices of the urethra, vagina, and rectum.

TAB.XXXII.

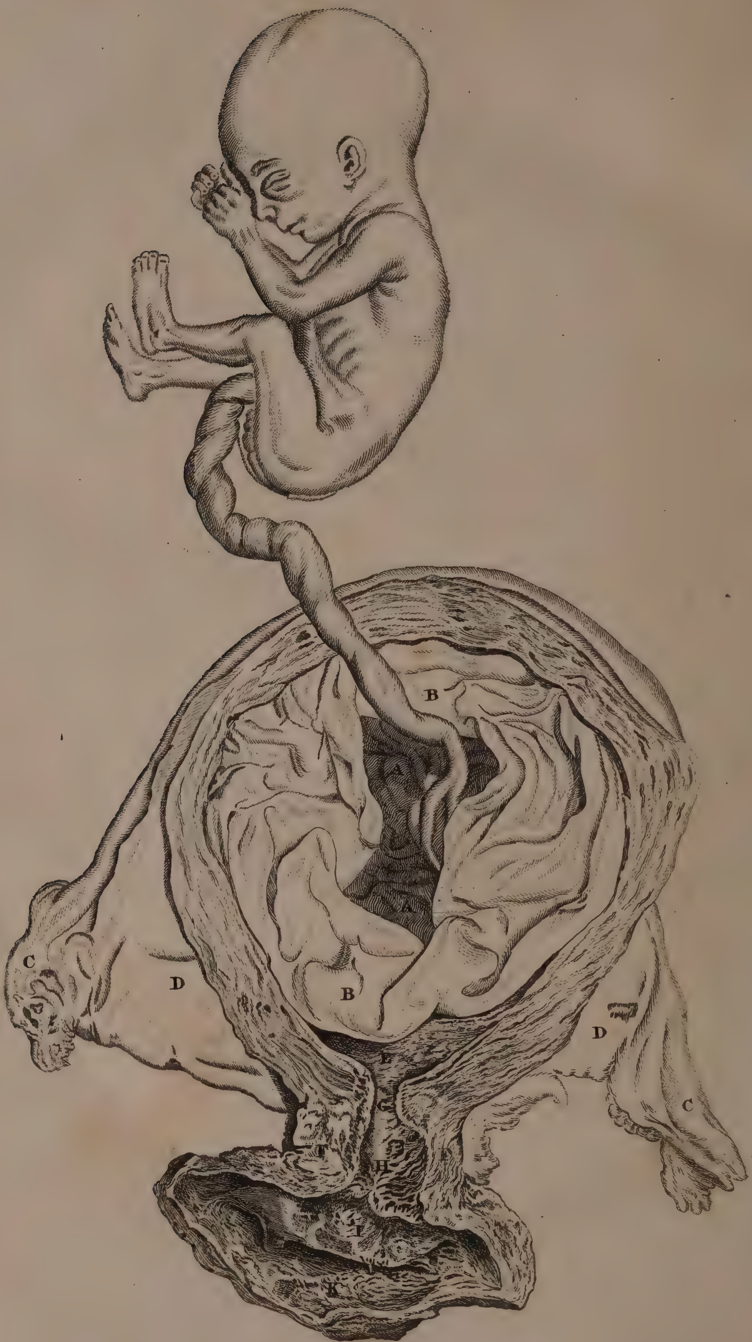


TABLE XXXII.

Gives a view of the UTERUS and FŒTUS in the Fifth Month of Pregnancy. The UTERUS is fully opened, and the FŒTUS taken out, to shew the proportions of the Child, the attachments of the UMBILICAL CORD and PLACENTA, with the dilated State of the CERVIX UTERI at this period of GESTATION.

A, A, The opening made in the membranes, for the extraction of the child, through which is seen the inside of the placenta around the termination of the umbilical cord.

B, B, The collapsed amnios and chorion, covered externally by the decidua reflexa, which had not as yet contracted an adhesion to the decidua.

C, C, The uterine tubes.

D, D, The ligamenta lata.

E, The decidua lining that part of the uterus where the placenta did not adhere to it.

F, F, The section, from side to side, of the substance of the cervix uteri.

G, The upper, narrower, and smaller part of the passage in the cervix uteri, where the decidua was continued down into the inner membrane of that passage.

H, The lower, wider, and rugous part of that passage.

I, The inside of the posterior lip of the os uteri.

K, The inside of the adjacent parts of the vagina.

TABLE XXXIII.

In a Child born at the full time, the Integuments, Bones, and Muscles, covering the Fore Part of the Thorax, cut and removed, to obtain a View of the Viscera. The Blood-Vessels were injected with Glue thrown into the Umbilical Vein.

A, A, The cut edge of the integuments and muscles of the thorax.

B, B, The upper part of the sternum, divided and drawn out.

C, C, A section of the ribs and intercostal muscles.

D, D, The flaps, formed by the under part of the integuments and muscles of the abdomen, turned down.

E, E, The two lobes of the thymus gland lying over the great vessels at the upper part of the heart; the cornua ascending some way in the neck.

F, Veins descending from the thyroid gland.

G, G, G, H, H, The three right, and two left lobes of the lungs, inflated.

I, The right auricle, and,

K, The right ventricle of the heart.

L, L, The cartilaginous margin of the thorax.

M, The cartilago ensiformis.

N, O, The right and left lobes of the liver, the left extending into the hypochondrium of that side.

P, The stomach.

Q, Q, The small intestines.

R, R, The colon.

TAB. XXVIII.

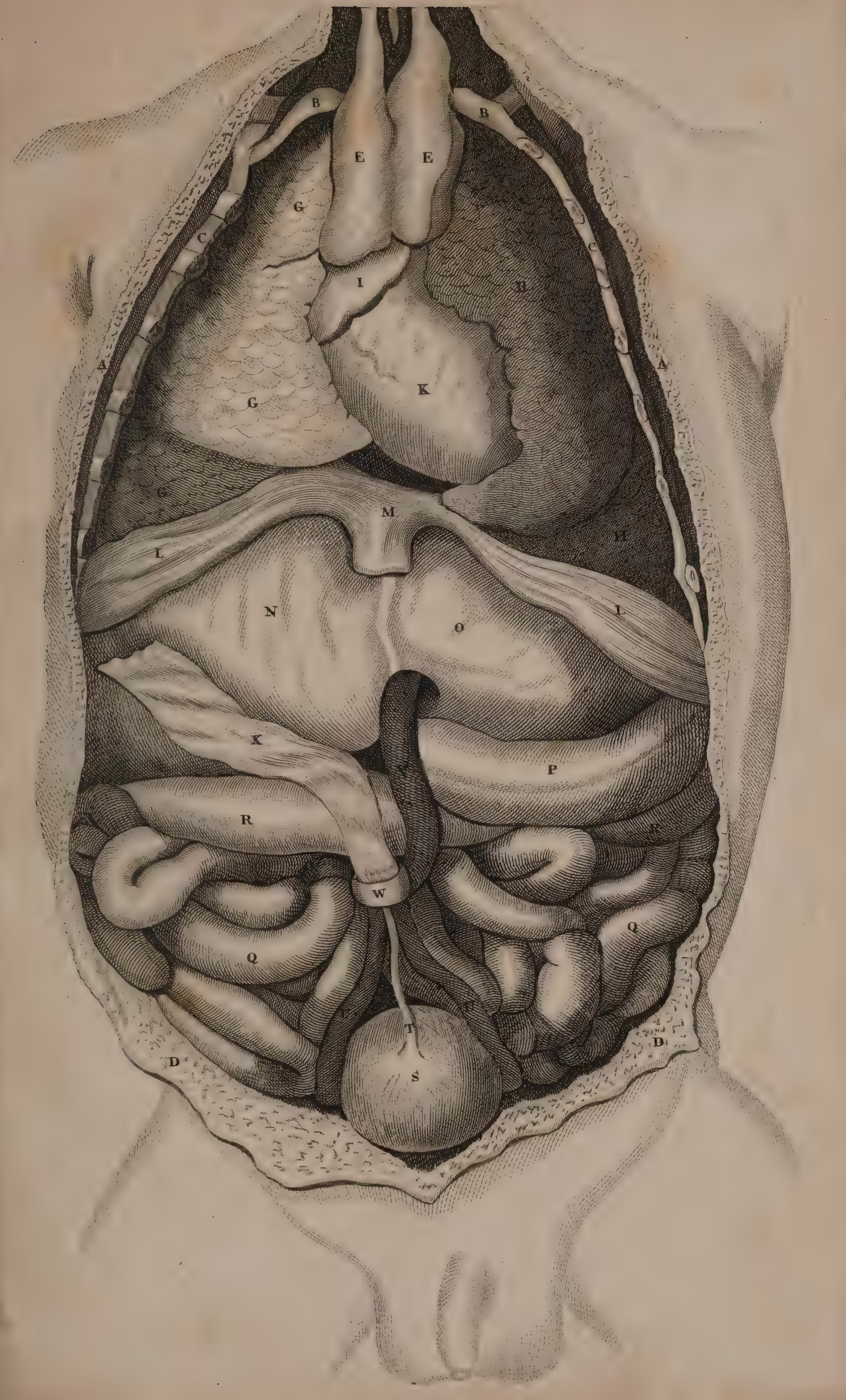


TABLE XXXIII. CONTINUED.

S, The bladder of urine inflated.
T, The urachus.
U, U, The two umbilical arteries.
V, The umbilical vein.
W, The umbilicus.
X, The collapsed umbilical cord.

TAB. XXXIV.

Fig. 1.

Fig. 2.

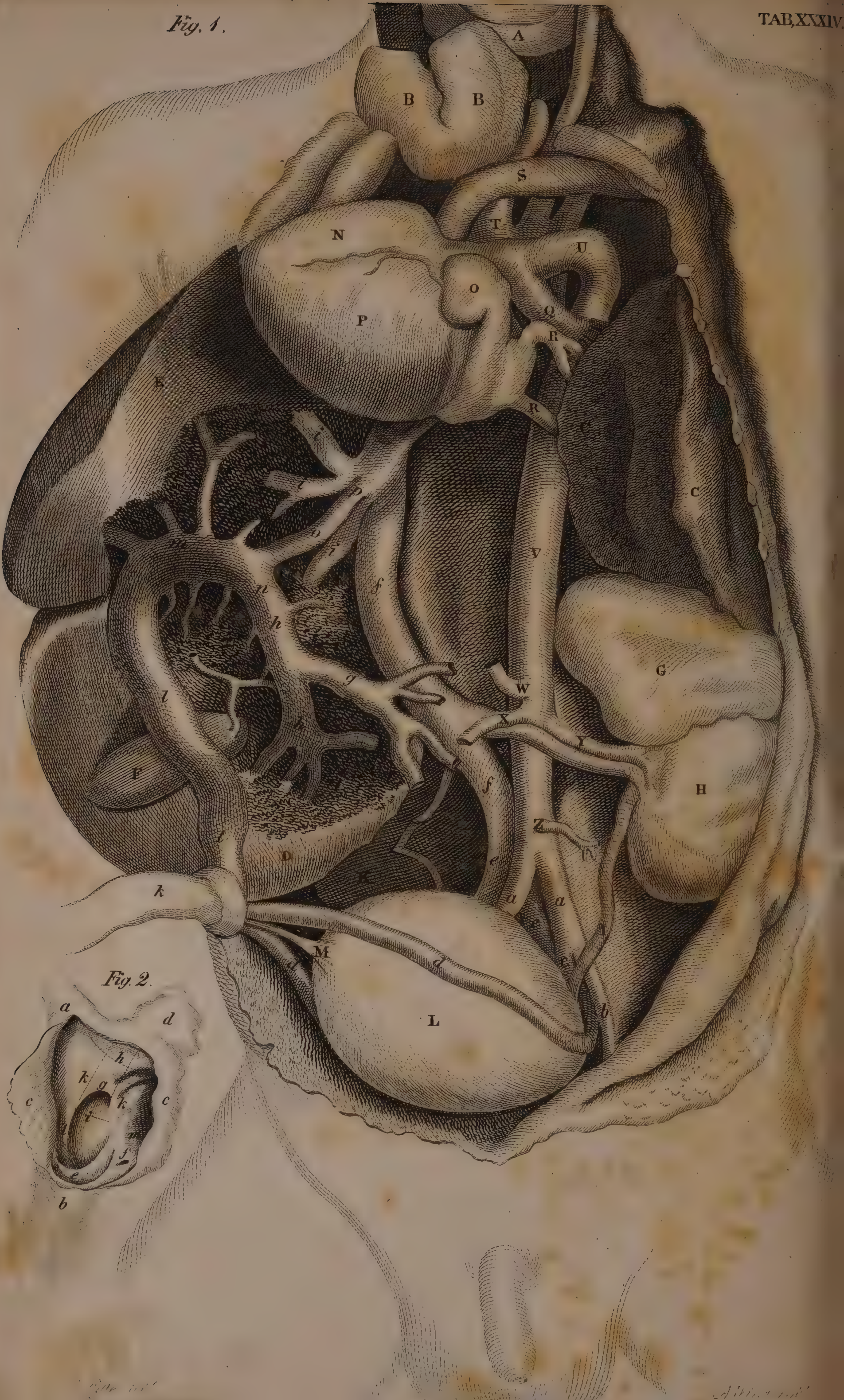


TABLE XXXIV.

The Peculiarities of the Blood-Vessels in the Fœtus, shewn from the same Subject with that represented in the former Table.

A, The thyroid gland.
B, B, The lobes of the thymus gland turned up.
C, C, The left lobes of the lungs.
D, E, The liver dissected and turned over to the right side; the inferior surface seen; D, the great, and E, the small lobe. As much of the substance of the liver is dissected away, as to shew the veins which enter it, or come out from it.
F, The gall-bladder, with the trunks of the biliary ducts.
G, The renal gland of the left side.
H, The corresponding kidney.
I, The ureter.
K, Part of the right kidney.
L, The bladder of urine inflated.
M, The urachus.
N, O, P, The heart drawn over to the right side; N, The right ventricle; O, The left auricle; P, The left ventricle.
Q, The left branch of the pulmonary artery.
R, R, The corresponding veins, with their termination in the left auricle.
S, The left subclavian vein.
T, The arch of the aorta, with the three great arteries sent off from it.

TABLE XXXIV. CONTINUED.

U, The ductus arteriosus, passing from the trunk of the pulmonary artery into the beginning of the descending aorta.

V, the continuation of the aorta descendens.

W, The cœliác artery.

X, The superior mesenteric artery.

Y, The left renal artery, with its corresponding vein.

Z, The inferior mesenteric artery.

a, *a*, The two common iliac arteries.

b, The external iliac artery of the left side.

c, The root of the internal iliac artery of that side.

d, *d*, The two umbilical arteries running along the sides of the bladder.

e, *e*, The common iliac veins.

f, *f*, The vena cava inferior.

g, The vena portæ.

h, *h*, The right and left branches of the vena portæ.

i, *i*, *i*, The venæ cavæ hepaticæ.

k, The collapsed umbilical cord.

l, The umbilical vein.

m, The umbilical vein sending branches to the right and left lobes of the liver, but chiefly to the latter.

n, The trunk common to the umbilical vein and left branch of the vena portæ.

o, The ductus venosus.

p, Its termination, along with the left vena hepatica, in the vena cava, where that great vein is about to perforate the diaphragm.

FIG. 2.

The RIGHT AURICLE *of the* FŒTUS *represented in the two last Tables, cut open to shew the* FORAMEN OVALE.

a, The vena cava superior, with its termination in the upper part of the right auricle.

b, The vena cava inferior, with the venæ hepaticæ terminating in it.

c, *c*, The right auricle cut open.

d, The proper auricle.

e, The valve of EUSTACHIUS over the mouth of the inferior cava, and its oblique situation seen with respect to the termination of the latter.

f, The termination of the great coronary vein at the left side of the EUSTACHIAN valve.

g, The beginning of the foramen ovale, which passes obliquely up between the septum of the auricles and the valve of the foramen.

h, A dotted line opposite to the upper edge of the valve of the foramen ovale.

i, A dotted line at the root of this valve.

k, *k*, Two dotted lines marking the size of the passage through the foramen ovale.

l, The annulus foraminis ovalis.

m, The passage of the right ventricle.